



OM-263 706A

2013-11

### Processes



TIG (GTAW) Welding



Stick (SMAW) Welding

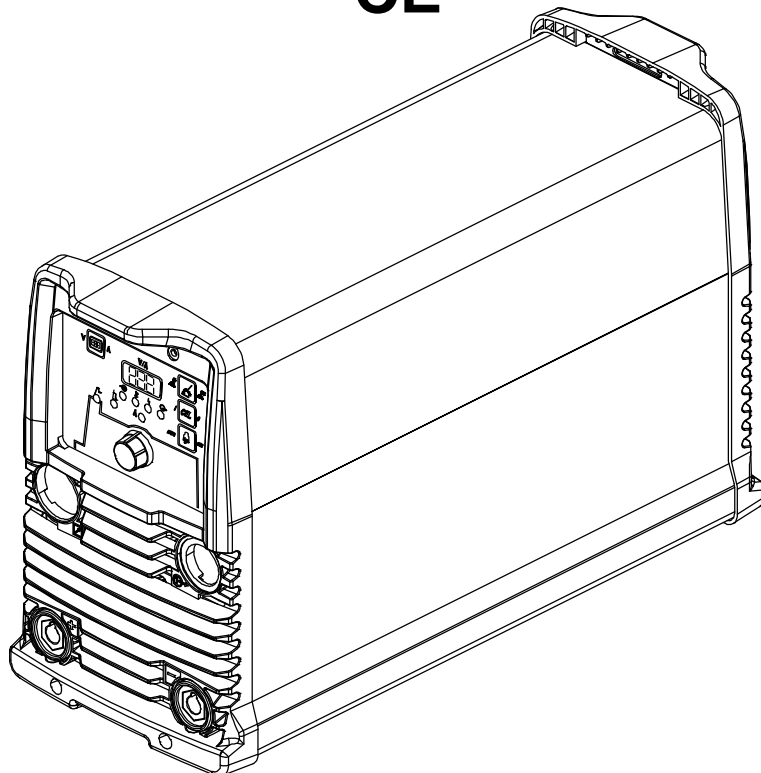
### Description



Arc Welding Power Source

# STi 270 And STi 270C

CE



## OWNER'S MANUAL

# From Miller to You

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*Thank you and congratulations* on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite. We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide which exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.



Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual catalog sheets.



Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.



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# DECLARATION OF CONFORMITY

for European Community (CE marked) products.

**ITW Welding Italy S.r.l Via Privata Iseo 6/E, 20098 San Giuliano M.se, (MI) Italy** declares that the product(s) identified in this declaration conform to the essential requirements and provisions of the stated Council Directive(s) and Standard(s).

Product/Apparatus Identification:

Product	Stock Number
STi 270	059016022
STi 270C	059016023

Council Directives:

- 2006/95/EC Low Voltage
- 2004/108/EC Electromagnetic Compatibility
- 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment

Standards:

- IEC 60974-1 Arc Welding Equipment - Welding Power Sources: edition 3, 2005-07.
- IEC 60974-10 Arc Welding Equipment - Electromagnetic Compatibility Requirements: edition 2.0, 2007-08.
- EN 50445:2008 Product family standard to demonstrate compliance of equipment for resistance welding, arc welding and allied processes with the basic restrictions related to human exposure to electromagnetic fields (0Hz-300Hz)

EU Signatory:

August 1<sup>st</sup> , 2013

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Massimiliano Lavarini

Date of Declaration

ELECTRONIC ENGINEER R&D TECH. SUPPORT

# SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

som 2013–09

 **Protect yourself and others from injury — read, follow, and save these important safety precautions and operating instructions.**

## 1-1. Symbol Usage



**DANGER!** – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.



Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

**NOTICE** – Indicates statements not related to personal injury.

 Indicates special instructions.



This group of symbols means Warning! Watch Out! **ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS** hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

## 1-2. Arc Welding Hazards



The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-5. Read and follow all Safety Standards.



Only qualified persons should install, operate, maintain, and repair this unit.



During operation, keep everybody, especially children, away.



### ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output **ONLY** if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install, ground, and operate this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in

disconnect box or that cord plug is connected to a properly grounded receptacle outlet.

- When making input connections, attach proper grounding conductor first – double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord and ground conductor for damage or bare wiring – replace immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or repaired cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal. Disconnect cable for process not in use.
- Use GFCI protection when operating auxiliary equipment in damp or wet locations.

### SIGNIFICANT DC VOLTAGE exists in inverter welding power sources **AFTER** removal of input power.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.



### HOT PARTS can burn.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.



## FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

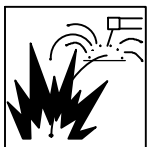
- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding fumes and gases. The recommended way to determine adequate ventilation is to sample for the composition and quantity of fumes and gases to which personnel are exposed.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watchperson nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.



## ARC RAYS can burn eyes and skin.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes from arc rays and sparks when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.
- Wear body protection made from durable, flame-resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.

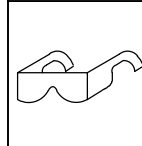


## WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on containers that have held combustibles, or on closed containers such as tanks, drums, or pipes unless they are properly prepared according to AWS F4.1 and AWS A6.0 (see Safety Standards).
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.

- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear body protection made from durable, flame-resistant material (leather, heavy cotton, wool). Body protection includes oil-free clothing such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or bypass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.
- Read and understand the Safety Data Sheets (SDSs) and the manufacturer's instructions for adhesives, coatings, cleaners, consumables, coolants, degreasers, fluxes, and metals.



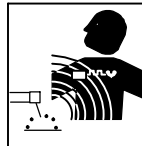
## FLYING METAL or DIRT can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.



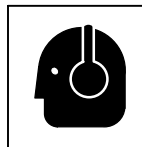
## BUILDUP OF GAS can injure or kill.

- Shut off compressed gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.



## ELECTRIC AND MAGNETIC FIELDS (EMF) can affect Implanted Medical Devices.

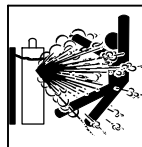
- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.



## NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.



## CYLINDERS can explode if damaged.

Compressed gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve. Do not stand in front of or behind the regulator when opening the valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

## 1-3. Additional Symbols For Installation, Operation, And Maintenance



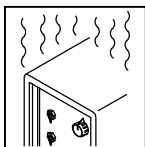
### **FIRE OR EXPLOSION hazard.**

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.



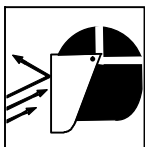
### **FALLING EQUIPMENT can injure.**

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94–110) when manually lifting heavy parts or equipment.



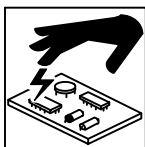
### **OVERUSE can cause OVERHEATING**

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



### **FLYING SPARKS can injure.**

- Wear a face shield to protect eyes and face.
- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Sparks can cause fires — keep flammables away.



### **STATIC (ESD) can damage PC boards.**

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.



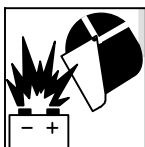
### **MOVING PARTS can injure.**

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.



### **WELDING WIRE can injure.**

- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.



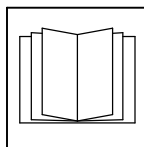
### **BATTERY EXPLOSION can injure.**

- Do not use welder to charge batteries or jump start vehicles unless it has a battery charging feature designed for this purpose.



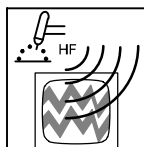
### **MOVING PARTS can injure.**

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Have only qualified persons remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power.



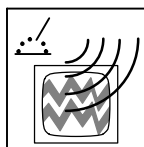
### **READ INSTRUCTIONS.**

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform maintenance and service according to the Owner's Manuals, industry standards, and national, state, and local codes.



### **H.F. RADIATION can cause interference.**


- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.




### **ARC WELDING can cause interference.**

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

## 1-4. California Proposition 65 Warnings

 **Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)**

 **This product contains chemicals, including lead, known to the state of California to cause cancer, birth defects, or other reproductive harm. *Wash hands after use.***

## 1-5. Principal Safety Standards

*Safety in Welding, Cutting, and Allied Processes*, ANSI Standard Z49.1, is available as a free download from the American Welding Society at <http://www.aws.org> or purchased from Global Engineering Documents (phone: 1-877-413-5184, website: [www.global.ihs.com](http://www.global.ihs.com)).

*Safe Practices for the Preparation of Containers and Piping for Welding and Cutting*, American Welding Society Standard AWS F4.1, from Global Engineering Documents (phone: 1-877-413-5184, website: [www.global.ihs.com](http://www.global.ihs.com)).

*Safe Practices for Welding and Cutting Containers that have Held Combustibles*, American Welding Society Standard AWS A6.0, from Global Engineering Documents (phone: 1-877-413-5184, website: [www.global.ihs.com](http://www.global.ihs.com)).

*National Electrical Code*, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: [www.nfpa.org](http://www.nfpa.org) and [www.sparky.org](http://www.sparky.org)).

*Safe Handling of Compressed Gases in Cylinders*, CGA Pamphlet P-1, from Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151 (phone: 703-788-2700, website: [www.cga-net.com](http://www.cga-net.com)).

*Safety in Welding, Cutting, and Allied Processes*, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060

Spectrum Way, Suite 100, Ontario, Canada L4W 5N5 (phone: 800-463-6727, website: [www.csa-international.org](http://www.csa-international.org)).

*Safe Practice For Occupational And Educational Eye And Face Protection*, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (phone: 212-642-4900, website: [www.ansi.org](http://www.ansi.org)).

*Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, NFPA Standard 51B, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: [www.nfpa.org](http://www.nfpa.org)).

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: [www.osha.gov](http://www.osha.gov)).

*Applications Manual for the Revised NIOSH Lifting Equation*, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30333 (phone: 1-800-232-4636, website: [www.cdc.gov/NIOSH](http://www.cdc.gov/NIOSH)).

## 1-6. EMF Information

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). The current from arc welding (and allied processes including spot welding, gouging, plasma arc cutting, and induction heating operations) creates an EMF field around the welding circuit. EMF fields may interfere with some medical implants, e.g. pacemakers. Protective measures for persons wearing medical implants have to be taken. For example, restrict access for passers-by or conduct individual risk assessment for welders. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Do not place your body between welding cables. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.

4. Keep head and trunk as far away from the equipment in the welding circuit as possible.
5. Connect work clamp to workpiece as close to the weld as possible.
6. Do not work next to, sit or lean on the welding power source.
7. Do not weld whilst carrying the welding power source or wire feeder.

### About Implanted Medical Devices:



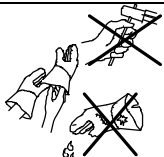
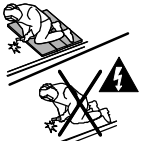
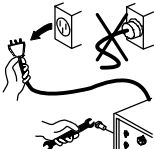

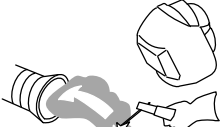
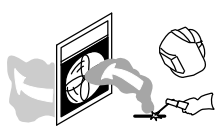
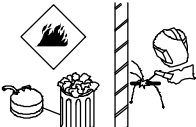
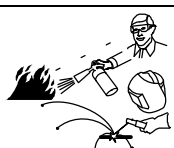
Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.



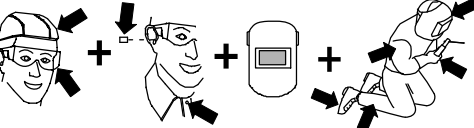
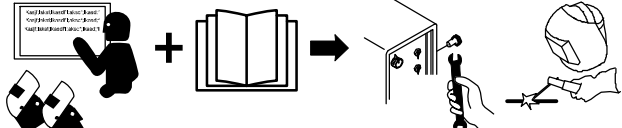


## SECTION 2 – DEFINITIONS



















### 2-1. Additional Safety Symbols And Definitions

 Some symbols are found only on CE products.

	<p>Warning! Watch Out! There are possible hazards as shown by the symbols.</p> <p>Safe1 2012-05</p>
	<p>Do not discard product (where applicable) with general waste.</p> <p>Reuse or recycle Waste Electrical and Electronic Equipment (WEEE) by disposing at a designated collection facility.</p> <p>Contact your local recycling office or your local distributor for further information.</p> <p>Safe37 2012-05</p>
	<p>Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves.</p> <p>Safe2 2012-05</p>
	<p>Protect yourself from electric shock by insulating yourself from work and ground.</p> <p>Safe3 2012-05</p>
	<p>Disconnect input plug or power before working on machine.</p> <p>Safe5 2012-05</p>
	<p>Keep your head out of the fumes.</p> <p>Safe6 2012-05</p>
	<p>Use forced ventilation or local exhaust to remove the fumes.</p> <p>Safe8 2012-05</p>
	<p>Use ventilating fan to remove fumes.</p> <p>Safe10 2012-05</p>
	<p>Keep flammables away from welding. Do not weld near flammables.</p> <p>Safe12 2012-05</p>
	<p>Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it.</p> <p>Safe14 2012-05</p>

	Do not weld on drums or any closed containers.	Safe16 2012-05
	Do not remove or paint over (cover) the label.	Safe20 2012-05
	Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.	Safe38 2012-05
	Become trained and read the instructions before working on the machine or welding.	Safe40 2012-05

## 2-2. Miscellaneous Symbols And Definitions

<b>A</b> Amperes	 Output/On	 Gas Tungsten Arc Welding (GTAW)	 Shielded Metal Arc Welding (SMAW)
<b>V</b> Volts	 Voltage Input	 3 Phase Static Frequency Converter-Transformer-Rectifier	
 Voltage Output	 Off	 Remote	 Lift-Arc Start (GTAW)
 Protective Earth (Ground)	 Process	 High Temperature	 Hot Start
<b>I</b> On	<b>%</b> Percent	<b>+</b> Positive	<b>—</b> Negative
 Alternating Current	<b>Hz</b> Hertz	 Arc Force (DIG)	<b>I<sub>2</sub></b> Rated Welding Current
<b>X</b> Duty Cycle	 Direct Current	 Line Connection	<b>U<sub>2</sub></b> Conventional Load Voltage
<b>U<sub>1</sub></b> Primary Voltage	<b>IP</b> Degree Of Protection	<b>I<sub>1max</sub></b> Rated Maximum Supply Current	<b>I<sub>1eff</sub></b> Maximum Effective Supply Current
 Set-Up	<b>U<sub>0</sub></b> Rated No Load Voltage (Average)		

# SECTION 3 – SPECIFICATIONS

## 3-1. Important Information Regarding CE Products (Sold Within The EU)

### A. Information On Electromagnetic Fields (EMF)

**⚠ This equipment shall not be used by the general public as the EMF limits for the general public might be exceeded during welding.**

This equipment is built in accordance with EN 60974–1 and is intended to be used only in an occupational environment (where the general public access is prohibited or regulated in such a way as to be similar to occupational use) by an expert or an instructed person.

Wire feeders and ancillary equipment (such as torches, liquid cooling systems and arc striking and stabilizing devices) as part of the welding circuit may not be a major contributor to the EMF. See the Owner's Manuals for all components of the welding circuit for additional EMF exposure information.

- The EMF assessment on this equipment was conducted at 0.5 meter.
- At a distance of 1 meter the EMF exposure values were less than 20% of the permissible values.

### B. Information On Electromagnetic Compatibility (EMC)

**⚠ This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.**

**⚠ This equipment does not comply with IEC 61000–3–12. If it is connected to a public low voltage system, it is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment can be connected.**

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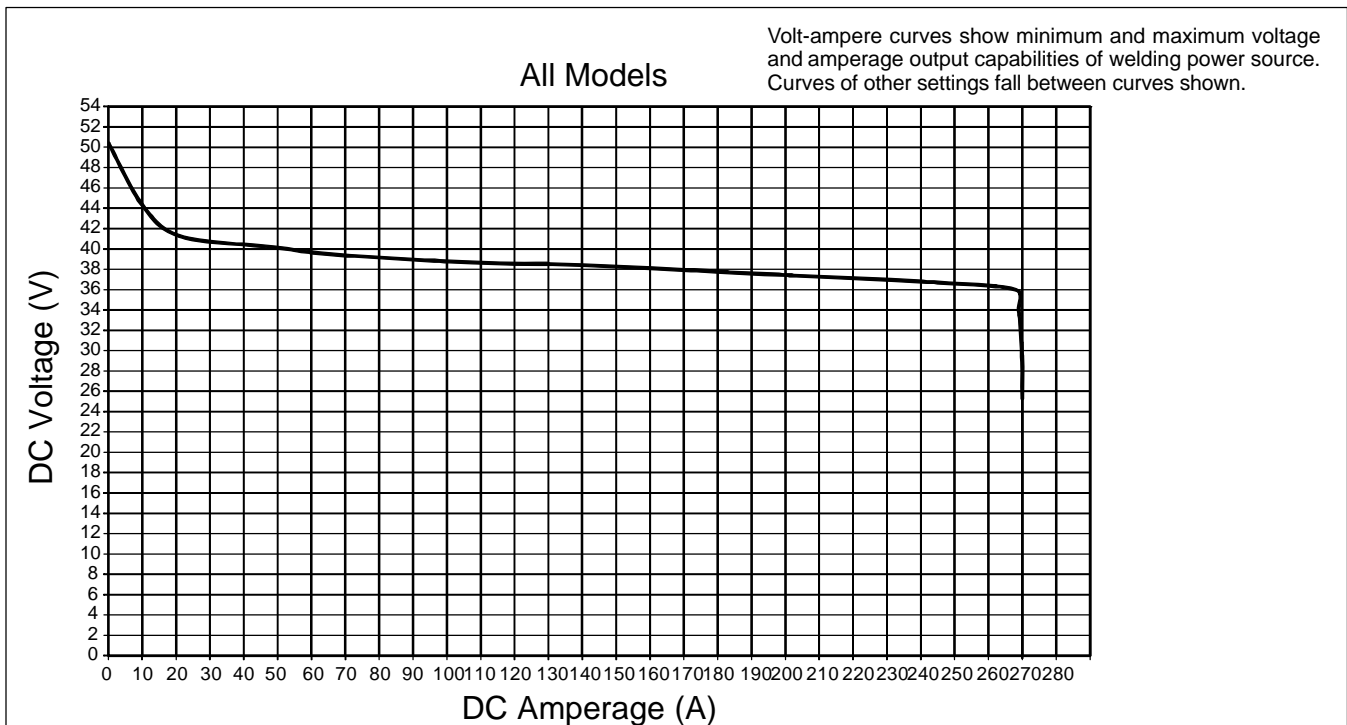
## 3-2. IP Rating

IP Rating: 23S. This equipment is designed for outdoor use. It may be stored, but is not intended to be used outside during precipitation unless sheltered. Operating temperature Range: 14° F (-10° C) to 104° F (40° C). Ratings were developed at an ambient temperature of 20° C to 25° C.

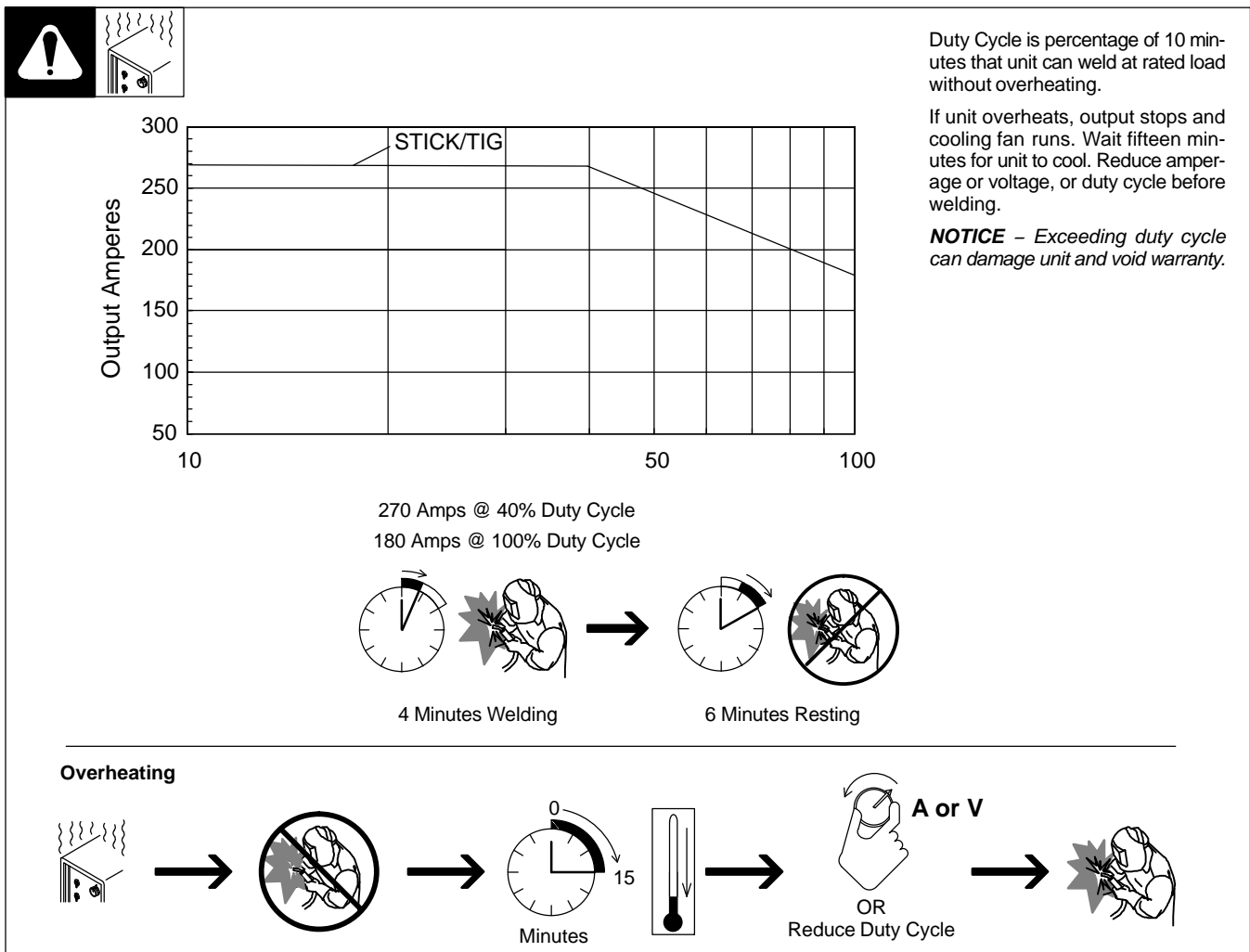
## 3-3. Specifications

Model	Input Power Three Phase AC50/60 Hz Voltage	Rated Welding Output		Max. Open- Circuit Voltage (U <sub>0</sub> )	Amperage Voltage Range DC	KVA/KW @ Duty Cycle	Dimensions	Weight Kg (Lb)
		100%	40%					
STi 270	400 Volts Stick	180 A 27.2 V	270 A 30.8 V	50 VDC	5 – 270 A 20 – 30.8 V	11.4 KVA / 10.3 KW 40% Duty Cycle 7.9 KVA / 7.06 KW 100% Duty Cycle	Length: 568 mm (22.4 in.) Width: 219 mm (8.6 in.) Height: 347 mm (13.7 in.)	Net: 23.2 (51.1) Ship: 25.2 (55.6)
	400 Volts TIG	180 A 17.2 V	270 A 20.8 V		5 – 270 A 10 – 20.8 V	7.7 KVA / 6.7 KW 40% Duty Cycle 4.8 KVA / 4.0 KW 100% Duty Cycle		
Sti 270C	400 Volts Stick	180 A 27.2 V	270 A 30.8 V	50 VDC	5 – 270 A 20 – 30.8 V	11.4 KVA / 10.3 KW 40% Duty Cycle 7.9 KVA / 7.06 KW 100% Duty Cycle	Length: 568 mm (22.4 in.) Width: 219 mm (8.6 in.) Height: 347 mm (13.7 in.)	Net: 23.4 (51.6) Ship: 25.4 (56)
	400 Volts TIG	180 A 17.2 V	270 A 20.8 V		5 – 270 A 10 – 20.8 V	7.7 KVA / 6.7 KW 40% Duty Cycle 4.8 KVA / 4.0 KW 100% Duty Cycle		

### 3-4. Volt-Ampere Curves



### 3-5. Duty Cycle And Overheating



## SECTION 4 – INSTALLATION

### 4-1. Serial Number And Rating Label Location

The serial number and rating information for the power source is located on the bottom of the machine. Use the rating labels to determine input power requirements and/or rated output. For future reference, write serial number in space provided on back cover of this manual.

### 4-2. Selecting A Location

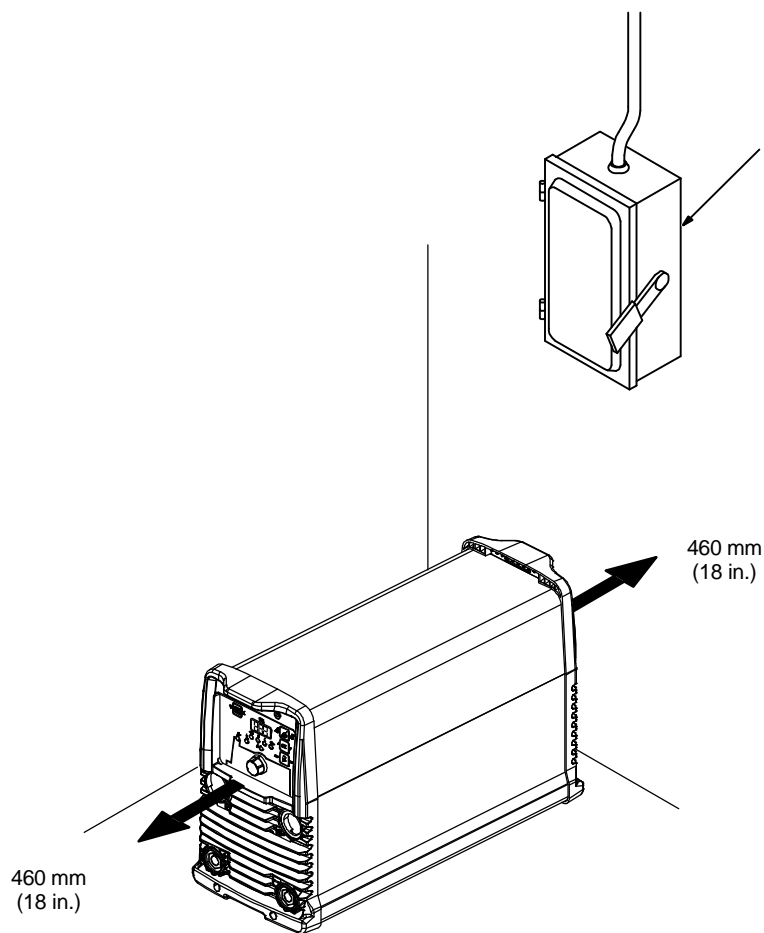


Location And Airflow

**⚠ Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.**




1 Line Disconnect Device

Locate unit near correct input power supply.



### 4-3. Weld Output Terminals And Selecting Cable Sizes\*

**NOTICE** – The Total Cable Length in Weld Circuit (see table below) is the combined length of both weld cables. For example, if the power source is 30 m (100 ft) from the workpiece, the total cable length in the weld circuit is 60 m (2 cables x 30 m). Use the 60 m (200 ft) column to determine cable size.

 <b>Weld Output Terminals</b>   Turn off power before connecting to weld output terminals.   Do not use worn, damaged, undersized, or repaired cables.	<b>Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding***</b>									
	<b>Welding Amperes</b>	<b>30 m (100 ft) or Less</b>		<b>45 m (150 ft)</b>	<b>60 m (200 ft)</b>	<b>70 m (250 ft)</b>	<b>90 m (300 ft)</b>	<b>105 m (350 ft)</b>	<b>120 m (400 ft)</b>	
		<b>10 – 60% Duty Cycle</b> <b>mm<sup>2</sup> (AWG)</b>	<b>60 – 100% Duty Cycle</b> <b>mm<sup>2</sup> (AWG)</b>	<b>10 – 100% Duty Cycle</b> <b>mm<sup>2</sup> (AWG)</b>						
	100	20 (4)	20 (4)	20 (4)	30 (3)	35 (2)	50 (1)	60 (1/0)	60 (1/0)	
	150	30 (3)	30 (3)	35 (2)	50 (1)	60 (1/0)	70 (2/0)	95 (3/0)	95 (3/0)	
	200	30 (3)	35 (2)	50 (1)	60 (1/0)	70 (2/0)	95 (3/0)	120 (4/0)	120 (4/0)	

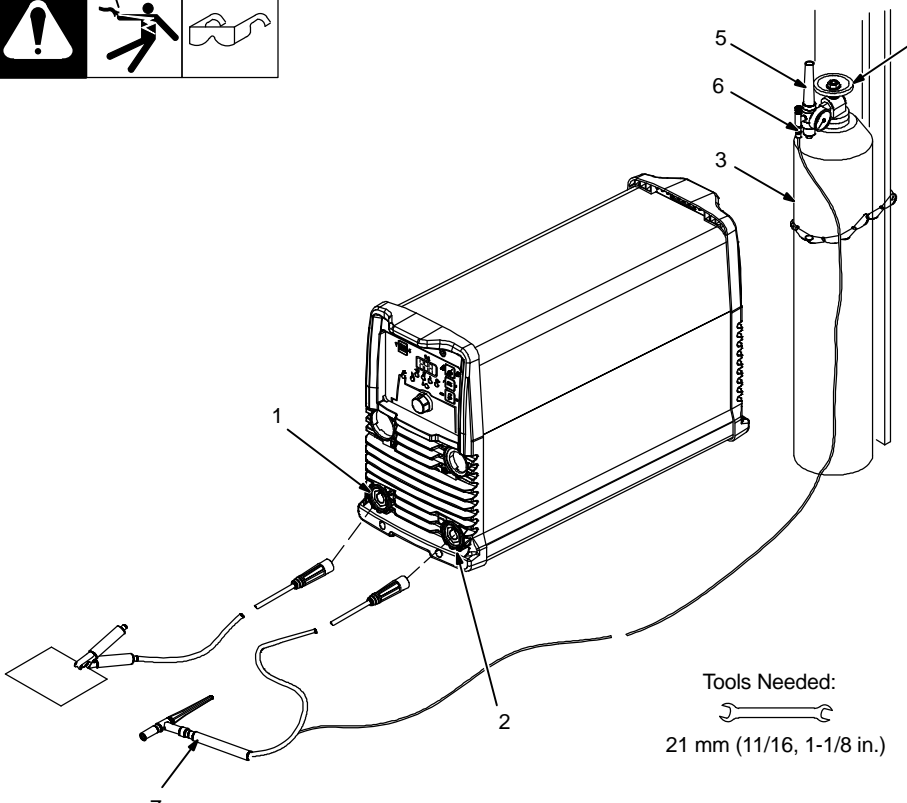
\* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.

\*\*Weld cable size is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere.

\*\*\*For distances longer than those shown in this guide, call a factory applications representative.

Milan Ref. S-0007-K 2013–10

### 4-4. TIG Lift-Arc DCEN (Direct Current Electrode Negative) Connections



**Tools Needed:**

21 mm (11/16, 1-1/8 in.)

⚠ **Turn off power before making connections.**

- Positive (+) Weld Output Terminal  
Connect work lead to positive weld output terminal.
- Negative (-) Weld Output Terminal  
Connect TIG torch to negative weld output terminal.
- Gas Cylinder
- Cylinder Valve  
Open valve slightly so gas flow blows dirt from valve. Close valve.
- Regulator/Flowmeter
- Flow Adjust  
Typical flow rate is 15 cubic feet per hour (7.1 liters per minute).  
Connect torch gas hose to regulator/flowmeter.
- Gas Valve  
Valve controls gas preflow and postflow. Open valve on torch just before welding.

## 4-5. Stick DCEP (Direct Current Electrode Positive) Connections



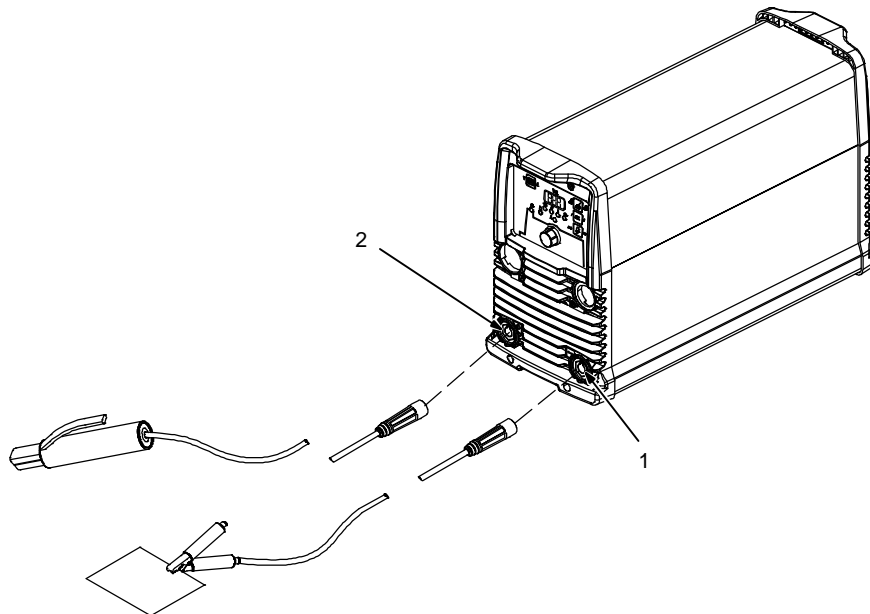
**⚠ Turn off power before making connections.**

1 Negative (–) Weld Output Terminal

Connect work lead to negative weld output terminal.

2 Positive (+) Weld Output Terminal

Connect electrode holder to positive weld output terminal.



## 4-6. Electrical Service Guide

Actual input voltage cannot exceed -10% of minimum, or +10% of maximum input voltages indicated in table.

**⚠ Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated circuit sized for the rated output and duty cycle of the welding power source.**

In dedicated circuit installations, the National Electrical Code (NEC) allows the receptacle or conductor rating to be less than the rating of the circuit protection device. All components of the circuit must be physically compatible. See NEC articles 210.21, 630.11, and 630.12.

	Three-Phase, 40% Duty Cycle
Input Voltage (V)	380 – 440 +/- 10%
Input Amperes (A) At Rated Output	16
Max Recommended Standard Fuse Rating In Amperes <sup>1</sup>	
Time Delay Fuses <sup>2</sup>	20
Normal Operating Fuses <sup>3</sup>	25
Min Input Conductor Size In mm <sup>2</sup> (AWG) <sup>4</sup>	2.5 (14)
Max Recommended Input Conductor Length In Meters (Feet)	45 (149)
Min Grounding Conductor Size In mm <sup>2</sup> (AWG) <sup>4</sup>	2.5 (14)

Reference: 2011 National Electrical Code (NEC) (including article 630)

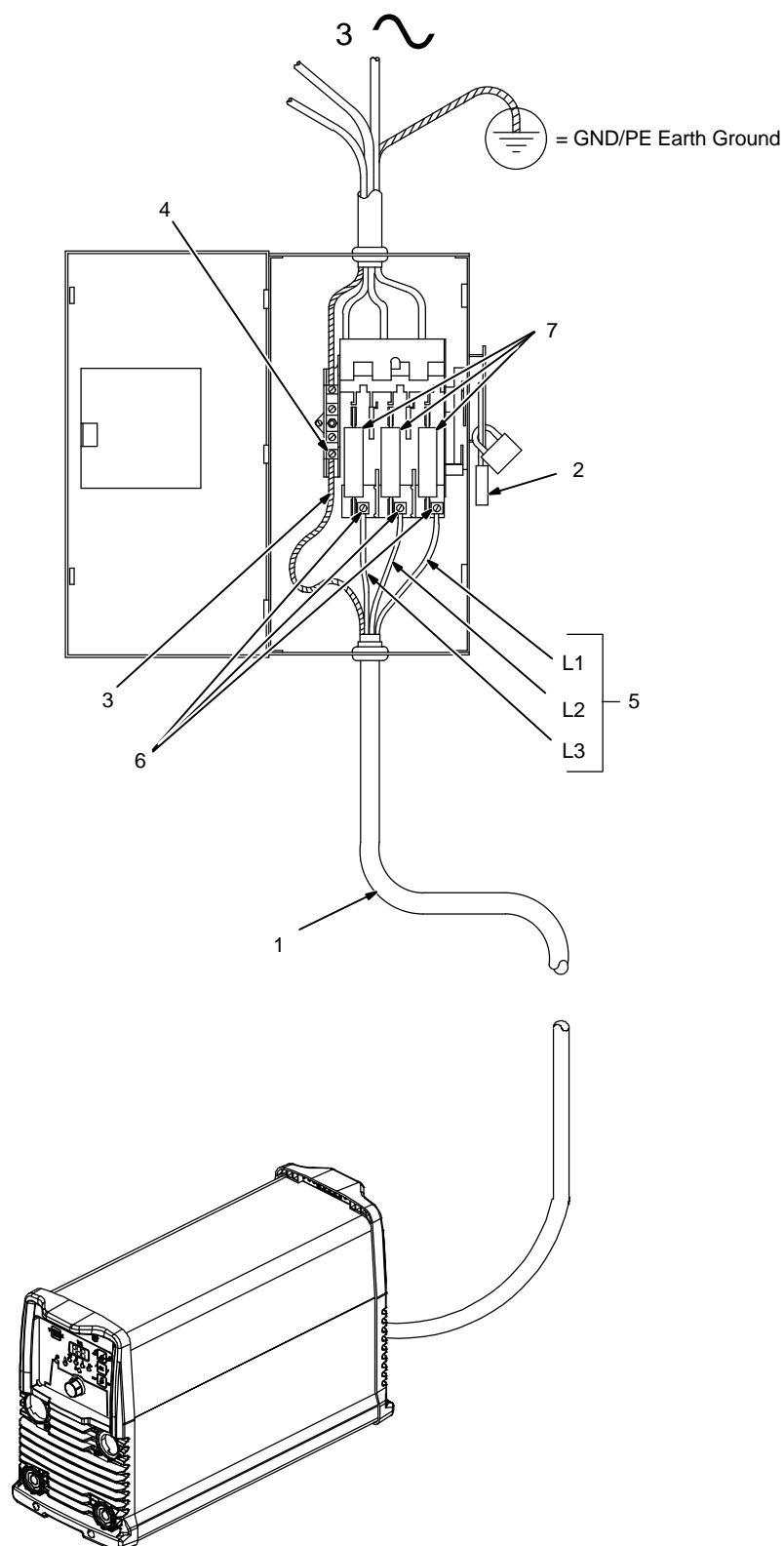
1 If a circuit breaker is used in place of a fuse, choose a circuit breaker with time-current curves comparable to the recommended fuse.

2 "Time-Delay" fuses are UL class "RK5" . See UL 248.

3 "Normal Operating" (general purpose - no intentional delay) fuses are UL class "K5" (up to and including 60 amps), and UL class "H" ( 65 amps and above).

4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.15(B)(16). If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.

## 4-7. Connecting 3-Phase Input Power



Tools Needed:

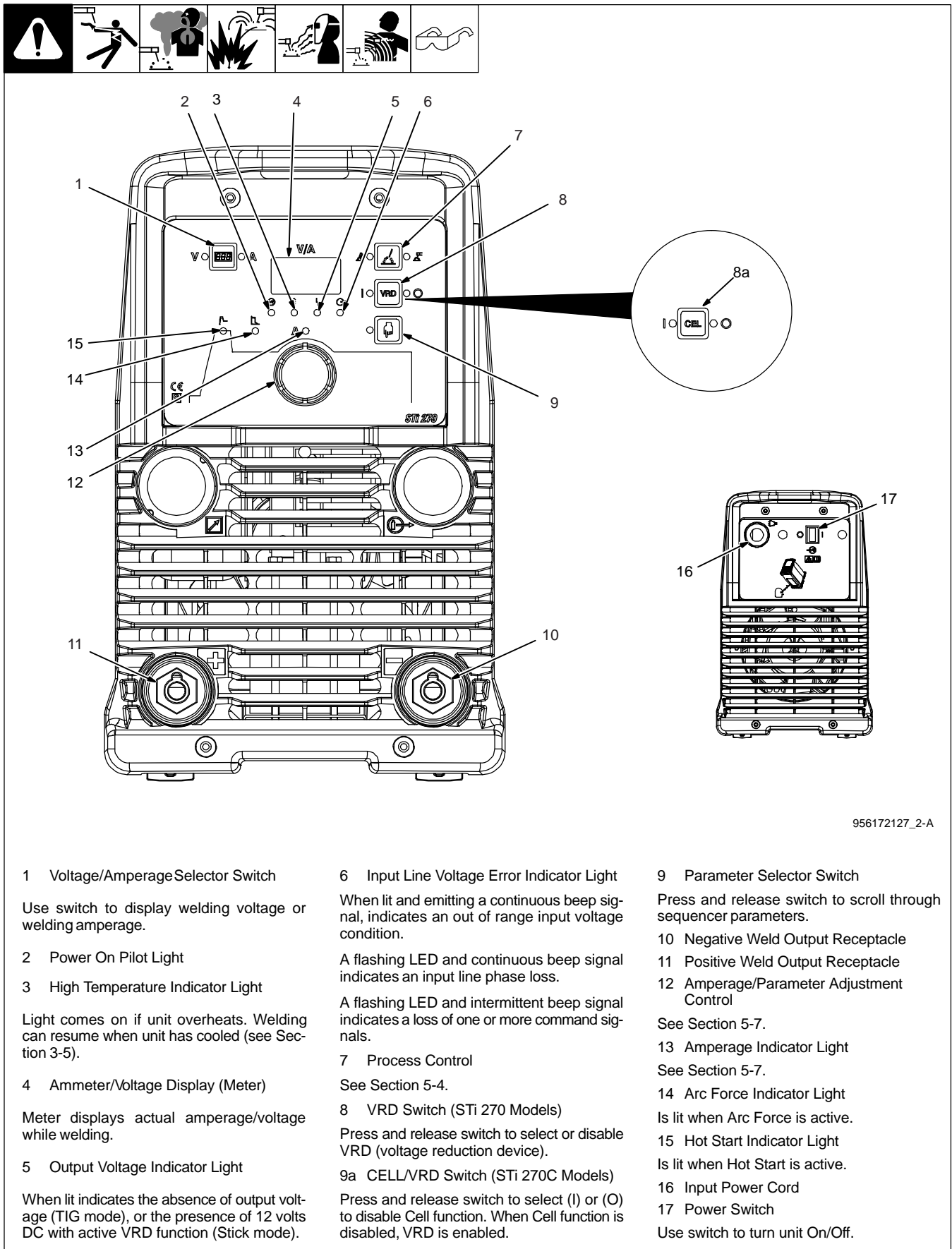




- Close and secure door on disconnect device.  
Follow established lockout/tagout procedures  
to put unit in service.

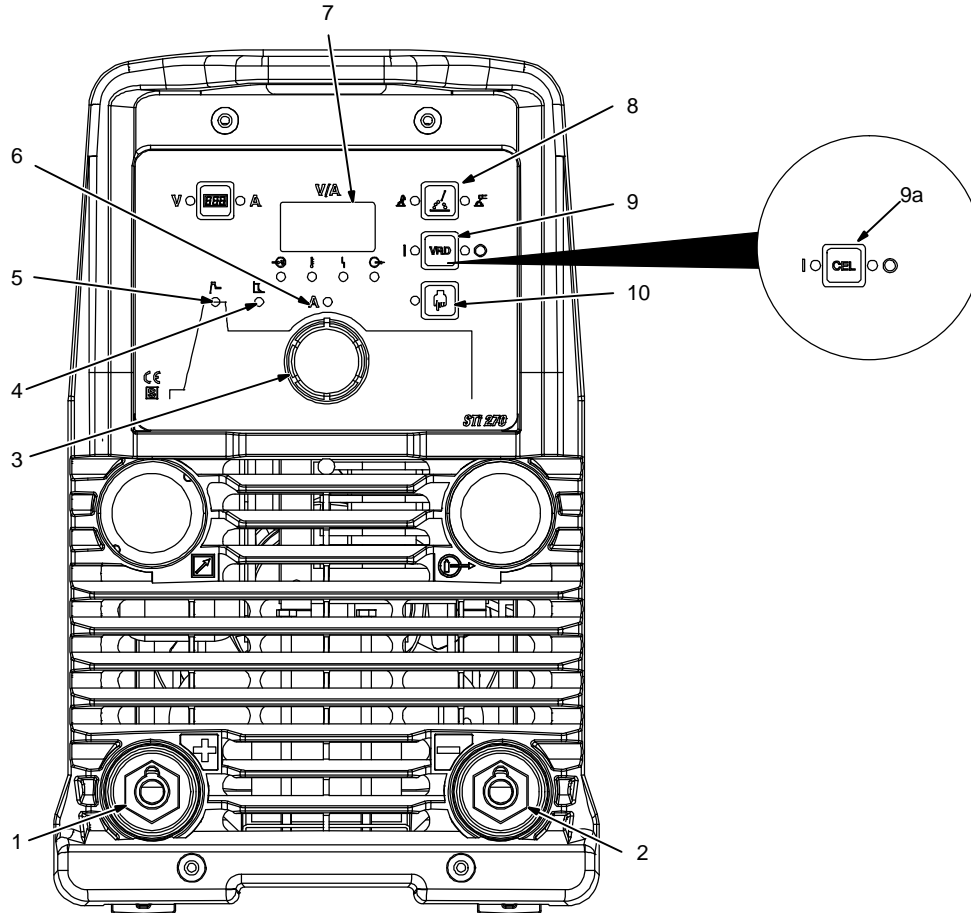
# SECTION 5 – OPERATION

## 5-1. Controls (STi 270 Model Shown)



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## 5-2. Preparing Unit For Stick (SMAW) Welding (STi 270 Model Shown)



- 1 Positive Weld Output Receptacle
- 2 Negative Weld Output Receptacle
- 3 Amperage/Parameter Control
- 4 Arc Force Indicator Light
- 5 Hot Start Indicator Light
- 6 Amperage Indicator Light
- 7 Ammeter/Voltage Display (Meter)
- 8 Process Control
- 9 VRD Selector Switch (STi 270 Models)
- 9a CELL/VRD Selector Switch (STi 270C Models)
- 10 Parameter Selector Switch

Connect electrode holder and work clamp (see Section 4-5). Turn power on. Allow time for unit to complete its start-up cycle.

Press and release Process control to select Stick welding and light corresponding LED.

### Voltage Reduction Setting (VRD) (STi 270 Model)

To change voltage reduction setting (VRD), proceed as follows: press and release the VRD switch to select VRD (LED I) or disable VRD (LED 0). Voltage reduction default is 12 volts.

### Stick Cellulosic Function Setting (CELL)

To select Cellulosic function (CELL), proceed as follows: press and release the CELL/VRD switch to enable CELL function and light corresponding LED.

Cellulosic electrode provides outstanding arc stability and penetration. It's ideal for welding in all positions.

### Hot Start

Use Hot Start to increase output amperage at the start of a weld to help prevent electrode sticking. To change Hot Start setting, proceed as follows: press and release parameter switch until Hot Start light is on. Use the Amperage/Parameter control to adjust the Hot Start value.

### Arc Force

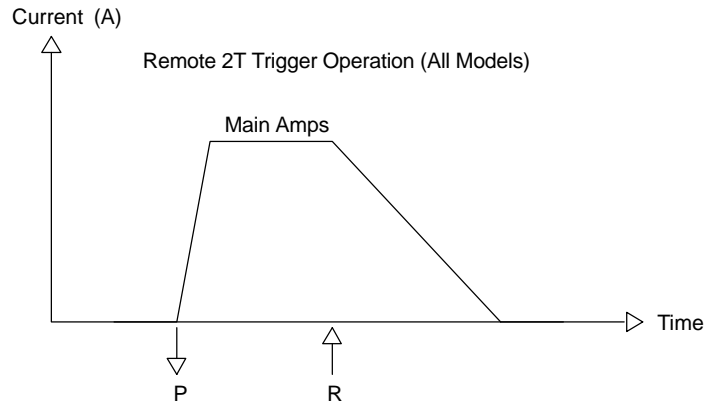
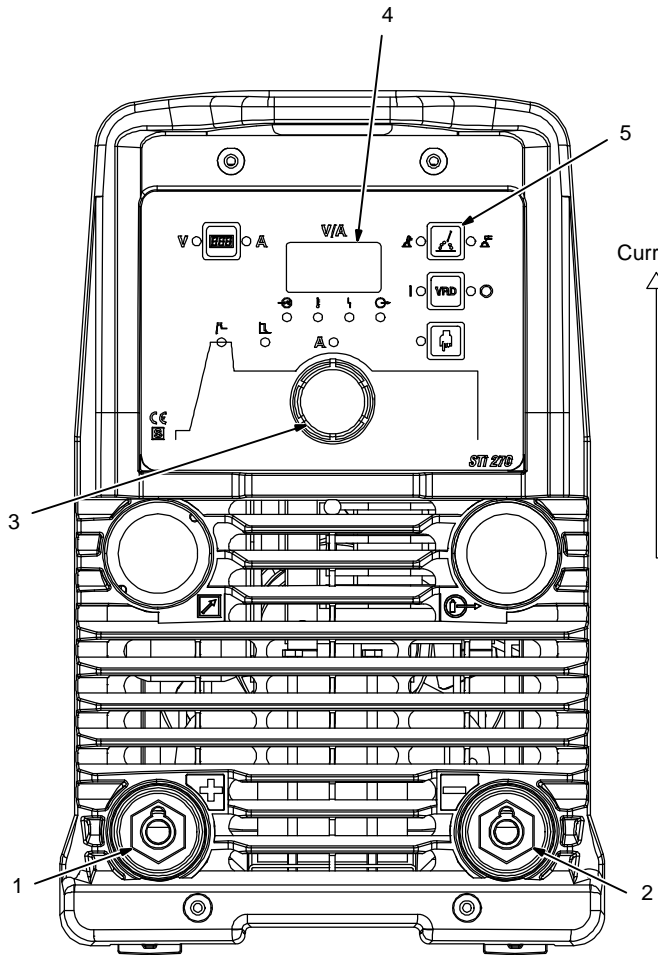
Use Arc Force to increase short-circuit amperage at low arc voltage. Set at 0 for normal welding amperage. Turn control clockwise to increase short-circuit amperage. To change Arc Force setting, proceed as follows: press and release parameter switch until the Arc Force light is on. Use the Amperage/Parameter control to adjust the Arc Force value.

*Unit will automatically exit the set-up menu if no activity is detected for more than five seconds. Press and release the parameter switch to re-enter set-up mode.*

### Weld Amperage

Use control to adjust welding amperage (see Section 5-7).

### 5-3. Preparing Unit For TIG (GTAW) Welding (STi 270 Model Shown)



- 1 Positive Weld Output Terminal
- 2 Negative Weld Output Terminal
- 3 Amperage/Parameter Control
- 4 Ammeter/Voltage Display (Meter)

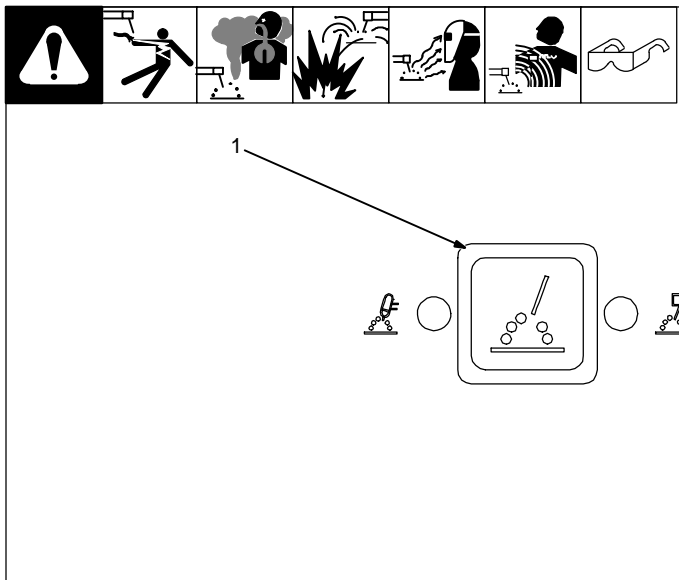
- 5 Process Selector Switch

Prepare unit for TIG welding as follows:  
connect electrode holder and work clamp  
(see Section 4-4). Turn power on. Allow

time for unit to complete its start-up cycle.

Press and release Process control to select TIG welding and light corresponding LED.

## 5-4. Process Control



### 1 Process Control

Use control to select Stick, or the TIG Lift Arc process.

**Stick (SMAW)** - This is a DCEP (direct current electrode positive) process (see Section 5-6). Make connections according to Section 4-5.

**TIG Lift-Arc™** - This is a DCEN (direct current electrode negative) process in which the electrode must come in contact with the work piece to initiate an arc (see Section 5-5). Make connections according to Section 4-4.

## 5-5. Lift-Arc Start Procedure



### Lift-Arc Start

With Lift-Arc™ selected, start arc as follows:

- 1 TIG Electrode
- 2 Workpiece

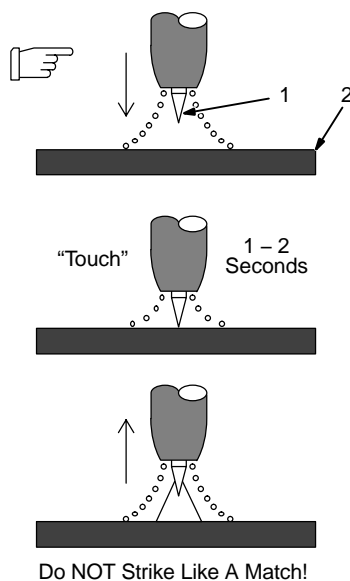
Turn gas on. Touch tungsten electrode to workpiece at weld start point. **Hold electrode to workpiece for 1-2 seconds**, and slowly lift electrode. Arc is formed when electrode is lifted.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece. The solid-state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

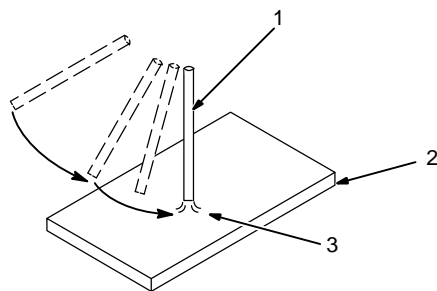
### Application:

Lift-Arc is used for the DCEN GTAW process when HF Start method is not permitted, or to replace the scratch method.

Lift-Arc Start Method



## 5-6. Stick Start Procedure – Scratch Start Technique



With Stick selected, start arc as follows:

- 1 Electrode
- 2 Workpiece
- 3 Arc

Drag electrode across workpiece like striking a match; lift electrode slightly after touching work. If arc goes out electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.



**When VRD is off, normal open-circuit voltage (50 volts) is present before electrode touches workpiece.**

When VRD is on, normal open-circuit voltage is not present before electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece.

## 5-7. Amperage Control (All Models)

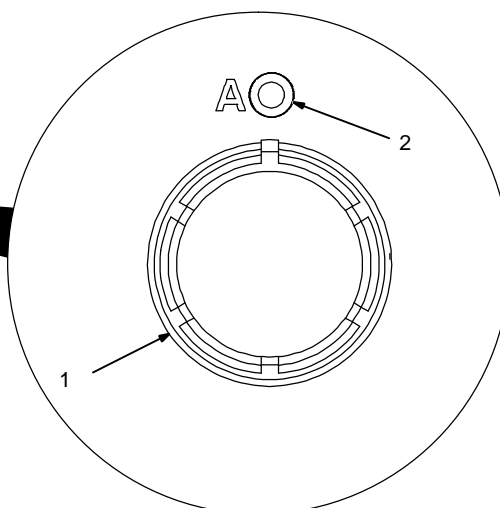
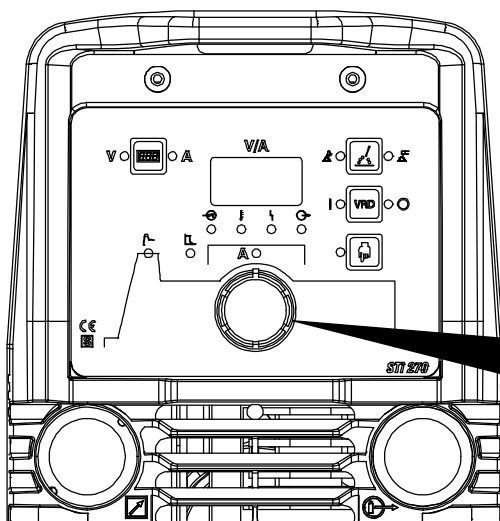


- 1 Amperage Control

Rotate control clockwise to increase amperage (0–270 amps).

- 2 Amperage Indicator LED

LED is lit when using the Amperage control.



# SECTION 6 – MAINTENANCE AND TROUBLESHOOTING

## 6-1. Routine Maintenance

**⚠ Disconnect power before maintaining.**

*Maintain more often during severe conditions.*

### A. Welding Power Source

⌚	✓ = Check * To be done by Factory Authorized Service Agent	◇ = Change	● = Clean	Δ = Repair	☆ = Replace
Every 3 Months	 ✓ ☆ Labels	 ✓ ☆ Gas Hoses			
Every 3 Months	 ✓ Δ ☆ Cables And Cords				
Every 6 Months	<p><b>⚠ Do not remove case when blowing out inside of unit (see Section 6-2) .</b></p> <p>●: During heavy service, clean monthly.</p>				

## 6-2. Blowing Out Inside Of Unit

**⚠ Do not remove case when blowing out inside of unit.**

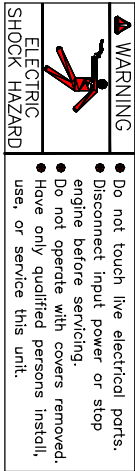
To blow out unit, direct airflow through front and back louvers as shown.

## 6-3. Troubleshooting



Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 4-7).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 4-7).
	Check for proper input power connections (see Section 4-7).
No weld output.	Input voltage outside acceptable range of variation (see Section 4-6).
No weld output; Overtemp LED on.	Unit overheated. Allow unit to cool with fan On (see Sections 3-5).
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 4-3).
	Clean and tighten all weld connections (see Section 4-3).
Fan not operating.	Check for and remove anything blocking fan movement.
	Have Factory Authorized Service Agent check fan motor.
Wandering arc	Use proper size tungsten (see Section 8).
	Use properly prepared tungsten (see Section 8).
	Reduce gas flow rate (see Section 4-4).
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.
	Allow adequate postflow time to shield tungsten while it cools, after welding stops.
	Check and tighten all gas fittings (see Section 4-4).
	Water in torch. Refer to torch manual.





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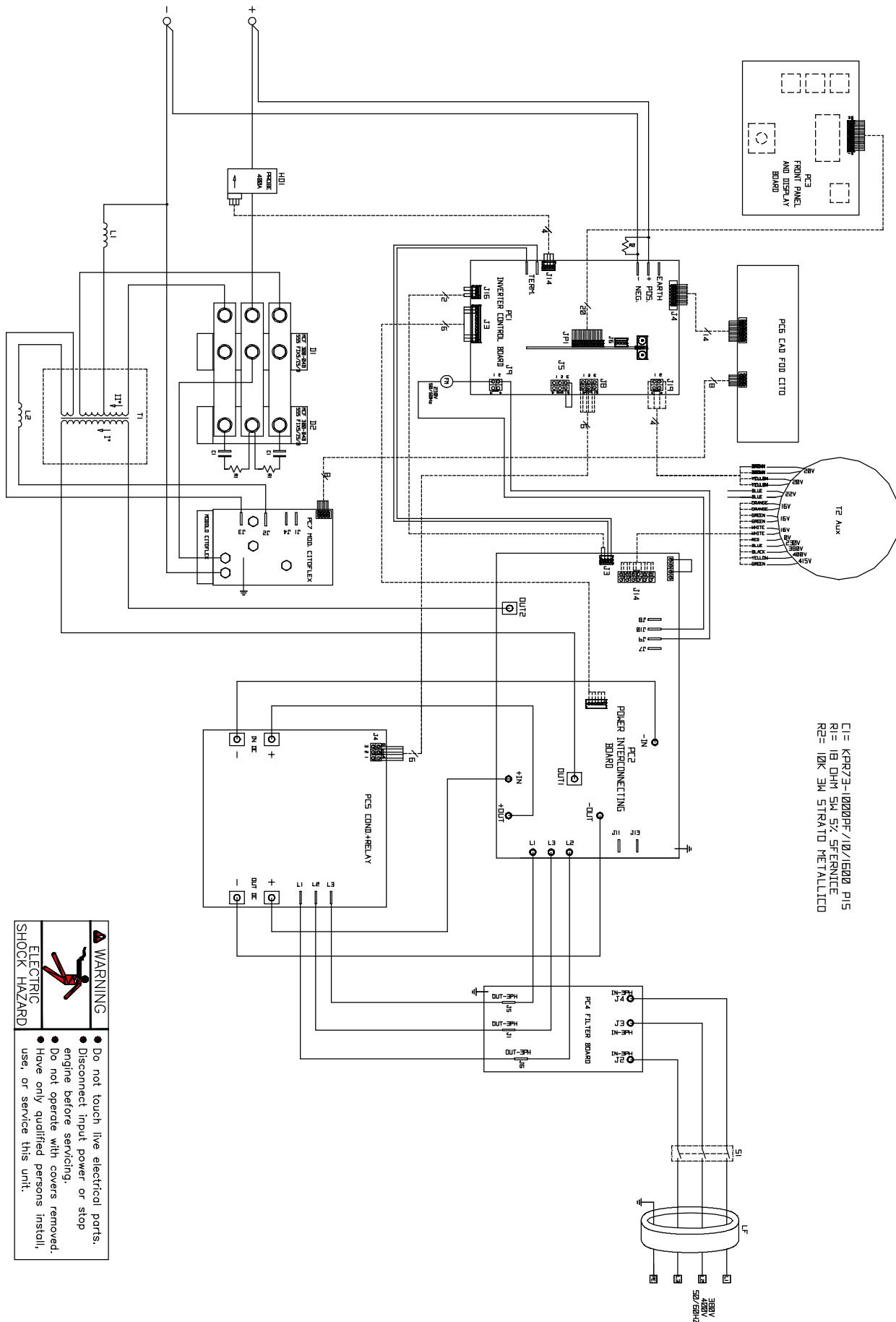


Figure 7-2. Circuit Diagram For STi 270C

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# SECTION 8 – SELECTING AND PREPARING A TUNGSTEN FOR DC OR AC WELDING WITH INVERTER MACHINES

gtaw\_Inverter\_2011-06



⚠ Whenever possible and practical, use DC weld output instead of AC weld output.

## 8-1. Selecting Tungsten Electrode (Wear Clean Gloves To Prevent Contamination Of Tungsten)

📖 Not all tungsten electrode manufacturers use the same colors to identify tungsten type. Contact the tungsten electrode manufacturer or reference the product packaging to identify the tungsten you are using.

Electrode Diameter	Amperage Range - Gas Type ♦ - Polarity	
	(DCEN) – Argon Direct Current Electrode Negative (For Use With Mild Or Stainless Steel)	AC – Argon Balance Control @ 65% Electrode Negative (For Use With Aluminum)
<b>2% Ceria, 1.5% Lanthanum, Or 2% Thorium Alloy Tungstens</b>		
.010 in. (1 mm)	Up to 25	Up to 20
.020 in. (1 mm)	15-40	15-35
.040 in. (1 mm)	25-85	20-80
1/16 in. (1.6 mm)	50-160	50-150
3/32 in. (2.4 mm)	130-250	135-235
1/8 in. (3.2 mm)	250-400	225-360
5/32 in. (4.0 mm)	400-500	300-450
3/16 in. (4.8 mm)	500-750	400-500
1/4 in. (6.4 mm)	750-1000	600-800

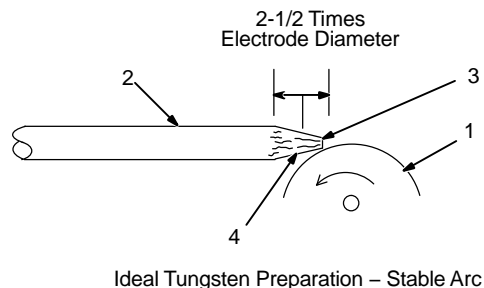
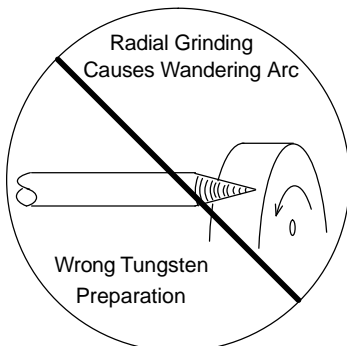
♦ Typical argon shielding gas flow rates are 11 to 35 CFH (cubic feet per hour).

Figures listed are a guide and are a composite of recommendations from American Welding Society (AWS) and electrode manufacturers.

## 8-2. Preparing Tungsten Electrode For DC Electrode Negative (DCEN) Welding Or AC Welding With Inverter Machines



⚠ Grinding the tungsten electrode produces dust and flying sparks which can cause injury and start fires. Use local exhaust (forced ventilation) at the grinder or wear an approved respirator. Read MSDS for safety information. Consider using tungsten containing ceria, lanthana, or yttria instead of thorium. Grinding dust from thoriated electrodes contains low-level radioactive material. Properly dispose of grinder dust in an environmentally safe way. Wear proper face, hand, and body protection. Keep flammables away.



### 1 Grinding Wheel

Grind end of tungsten on fine grit, hard abrasive wheel before welding. Do not use wheel for other jobs or tungsten can become contaminated causing lower weld quality.

### 2 Tungsten Electrode

A 2% ceriated tungsten is recommended.

### 3 Flat

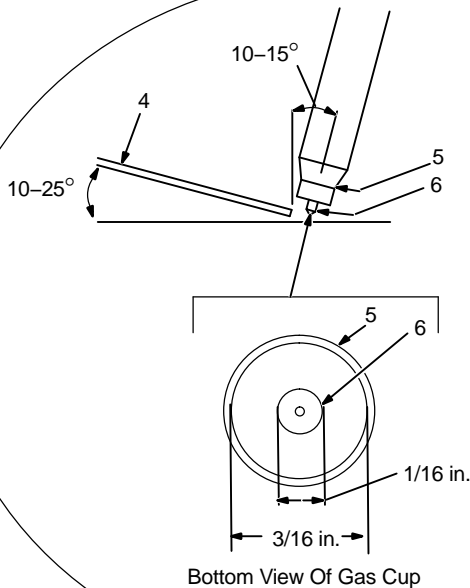
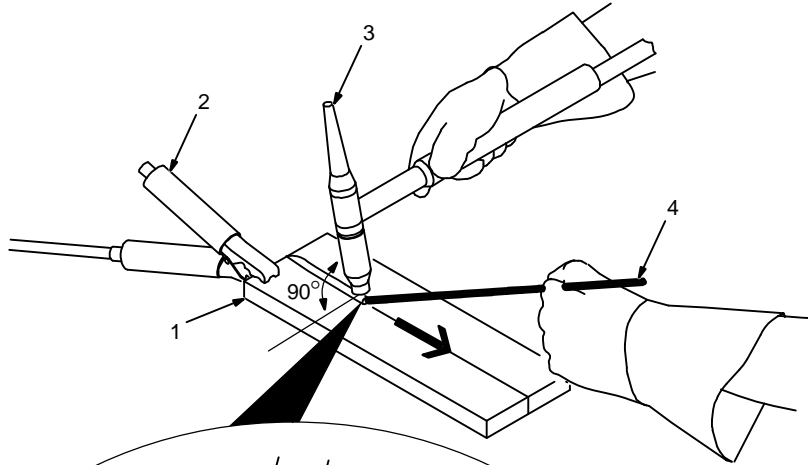
Diameter of this flat determines amperage capacity.

### 4 Straight Ground

Grind lengthwise, **not radial**.

# SECTION 9 – GUIDELINES FOR TIG WELDING (GTAW)

## 9-1. Positioning The Torch



**⚠** Grinding the tungsten electrode produces dust and flying sparks which can cause injury and start fires. Use local exhaust (forced ventilation) at the grinder or wear an approved respirator. Read MSDS for safety information. Consider using cerium or lanthanum based tungsten instead of thoriated. Thorium dust contains low-level radioactive material. Properly dispose of grinder dust in an environmentally safe way. Wear proper face, hand, and body protection. Keep flammables away.

### 1 Workpiece

Make sure workpiece is clean before welding.

### 2 Work Clamp

Place as close to the weld as possible.

### 3 Torch

### 4 Filler Rod (If Applicable)

### 5 Gas Cup

### 6 Tungsten Electrode

Select and prepare tungsten according to Section 8.

### Guidelines:

The inside diameter of the gas cup should be at least three times the tungsten diameter to provide adequate shielding gas coverage. (For example, if tungsten is 1/16 in. diameter, gas cup should be a minimum of 3/16 in. diameter.

Tungsten extension is the distance the tungsten extends out gas cup of torch.

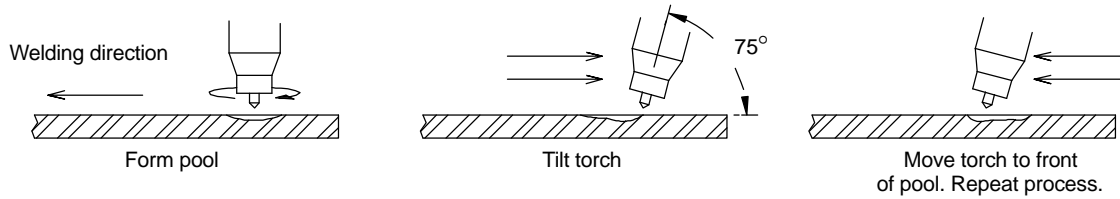
The tungsten extension should be no greater than the inside diameter of the gas cup.

Arc length is the distance from the tungsten to the workpiece.

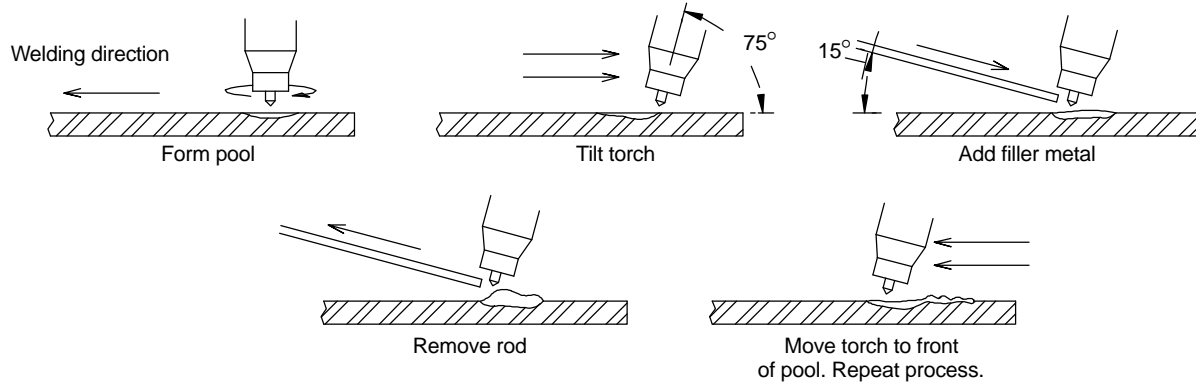
Ref. ST-161 892

## 9-2. Torch Movement During Welding

### Tungsten Without Filler Rod



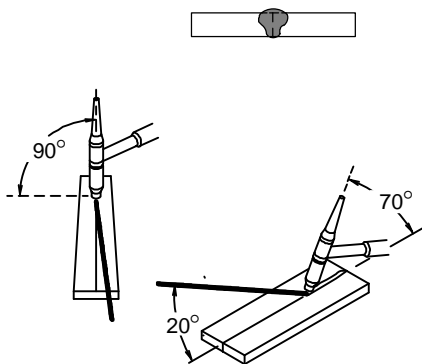
### Tungsten With Filler Rod



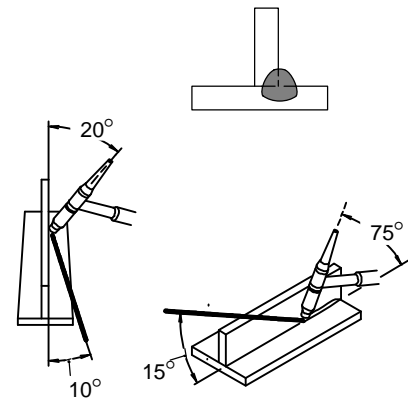
ST-162 002-B

## 9-3. Positioning Torch Tungsten For Various Weld Joints

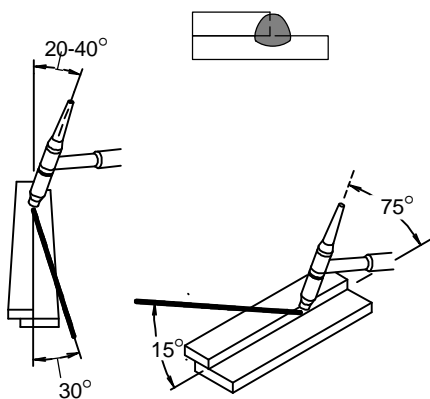
### Butt Weld And Stringer Bead



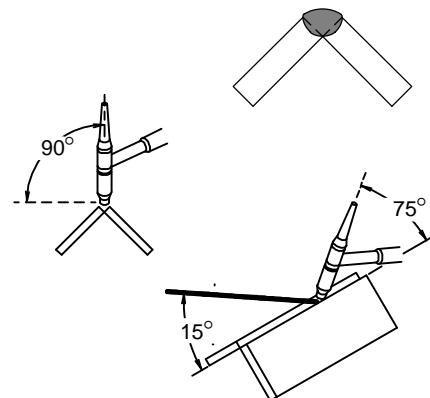
### "T" Joint



### Lap Joint



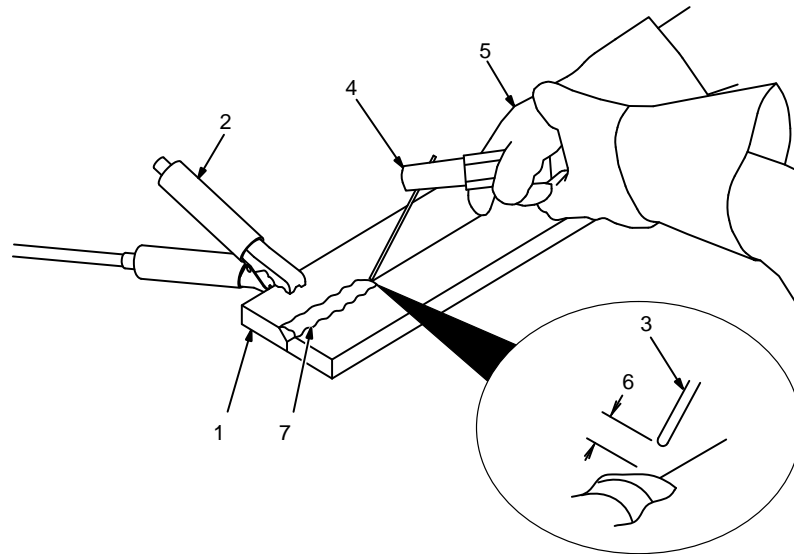
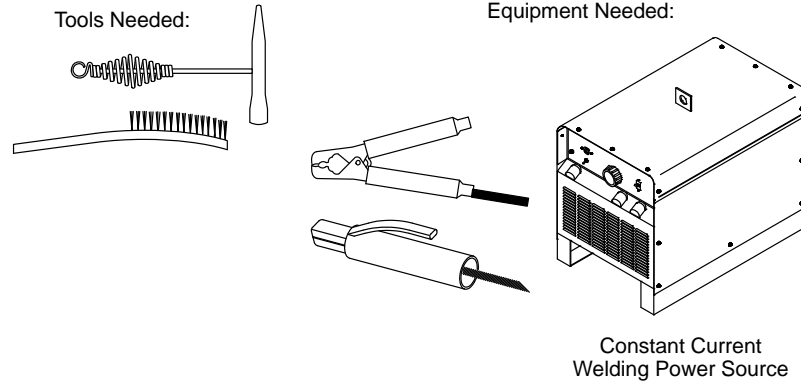
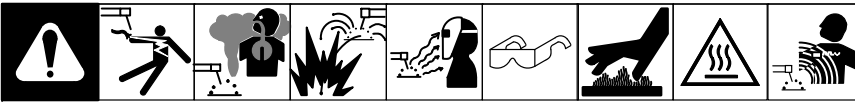
### Corner Joint



ST-162 003 / S-0792

# SECTION 10 – STICK WELDING (SMAW) GUIDELINES

## 10-1. Stick Welding Procedure



**⚠** Weld current starts when electrode touches workpiece.

**⚠** Weld current can damage electronic parts in vehicles. Disconnect both battery cables before welding on a vehicle. Place work clamp as close to the weld as possible.

Always wear appropriate personal protective clothing.

### 1 Workpiece

Make sure workpiece is clean before welding.

### 2 Work Clamp

Place as close to the weld as possible.

### 3 Electrode

Before striking an arc, insert an electrode in the electrode holder. A small diameter electrode requires less current than a large one. Follow recommendations of the electrode manufacturer when setting weld amperage (see Section 10-2).

### 4 Insulated Electrode Holder

### 5 Electrode Holder Position

### 6 Arc Length

Arc length is the distance from the electrode to the workpiece. A short arc with correct amperage will give a sharp, crackling sound. Correct arc length is related to electrode diameter. Examine the weld bead to determine if the arc length is correct.

Arc length for 1/16 and 3/32 in. diameter electrodes should be about 1/16 in. (1.6 mm); arc length for 1/8 and 5/32 in. electrodes should be about 1/8 in. (3 mm).

### 7 Slag

Use a chipping hammer and wire brush to remove slag. Remove slag and check weld bead before making another weld pass.

## 10-2. Electrode and Amperage Selection Chart



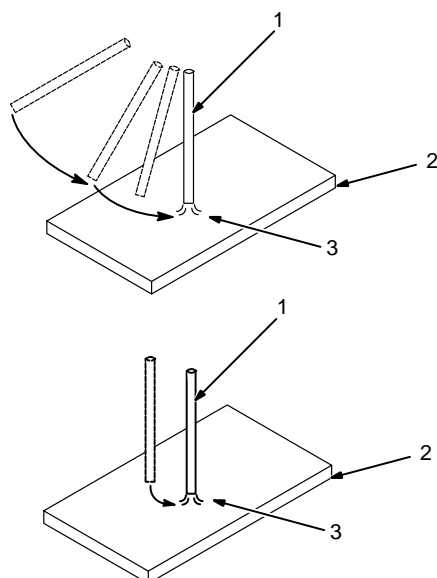
ELECTRODE	DIAMETER	AMPERAGE RANGE								
		50	100	150	200	250	300	350	400	450
6010 & 6011	3/32									
	1/8									
	5/32									
	3/16									
	7/32									
6013	1/4									
	1/16									
	5/64									
	3/32									
	1/8									
7014	5/32									
	3/16									
	7/32									
	1/4									
	3/32									
7018	1/8									
	5/32									
	3/16									
	7/32									
	1/4									
7024	3/32									
	1/8									
	5/32									
	3/16									
	7/32									
Ni-CI	1/4									
	3/32									
	1/8									
	5/32									
	3/16									
308L	7/32									
	1/4									
	3/32									
	1/8									
	5/32									

ELECTRODE	DC*	AC	POSITION	PENETRATION	USAGE
6010	EP		ALL	DEEP	MIN. PREP, ROUGH HIGH SPATTER
6011	EP	✓	ALL	DEEP	
6013	EP,EN	✓	ALL	LOW	GENERAL
7014	EP,EN	✓	ALL	MED	SMOOTH, EASY, FAST
7018	EP	✓	ALL	MED	LOW HYDROGEN, STRONG
7024	EP,EN	✓	FLAT HORIZ FILLET	LOW	SMOOTH, EASY, FASTER
NI-CL	EP	✓	ALL	LOW	CAST IRON
308L	EP	✓	ALL	LOW	STAINLESS

\*EP = ELECTRODE POSITIVE (REVERSE POLARITY)  
EN = ELECTRODE NEGATIVE (STRAIGHT POLARITY)

Ref. S-087 985-A

## 10-3. Striking an Arc



**⚠ Weld current starts when electrode touches workpiece.**

- 1 Electrode
- 2 Workpiece
- 3 Arc

### Scratch Technique

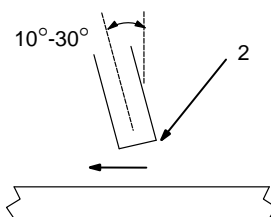
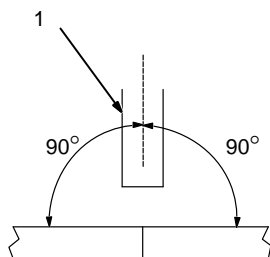
Drag electrode across workpiece like striking a match; lift electrode slightly after touching work. If arc goes out, electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

### Tapping Technique

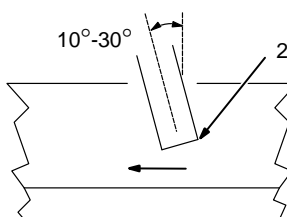
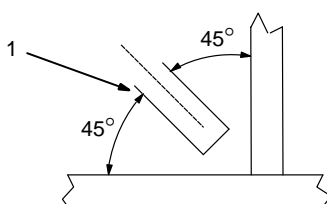
Bring electrode straight down to workpiece; then lift slightly to start arc. If arc goes out, electrode was lifted too high. If electrode sticks to workpiece, use a quick twist to free it.

S-0049 / S-0050

## 10-4. Positioning Electrode Holder



Groove Welds



Fillet Welds

- 1 End View Of Work Angle
- 2 Side View Of Electrode Angle

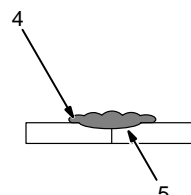
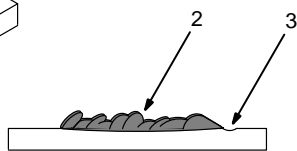
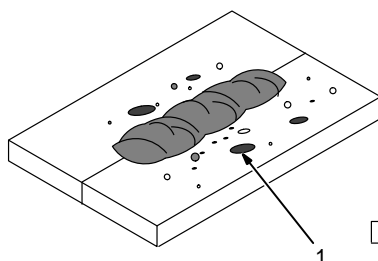
After learning to start and hold an arc, practice running beads of weld metal on flat plates using a full electrode.

Hold the electrode nearly perpendicular to the work, although tilting it ahead (in the direction of travel) will be helpful.

*To produce the best results, hold a short arc, travel at a uniform speed, and feed the electrode downward at a constant rate as it melts.*

S-0060

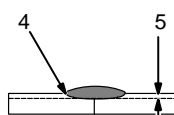
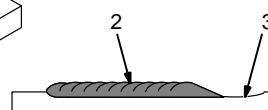
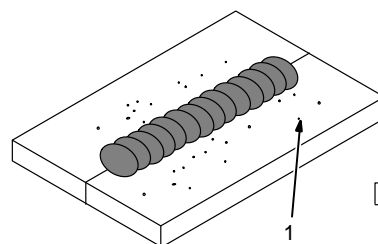
## 10-5. Poor Weld Bead Characteristics



- 1 Large Spatter Deposits
- 2 Rough, Uneven Bead
- 3 Slight Crater During Welding
- 4 Bad Overlap
- 5 Poor Penetration

S-0053-A

## 10-6. Good Weld Bead Characteristics



- 1 Fine Spatter
- 2 Uniform Bead
- 3 Moderate Crater During Welding

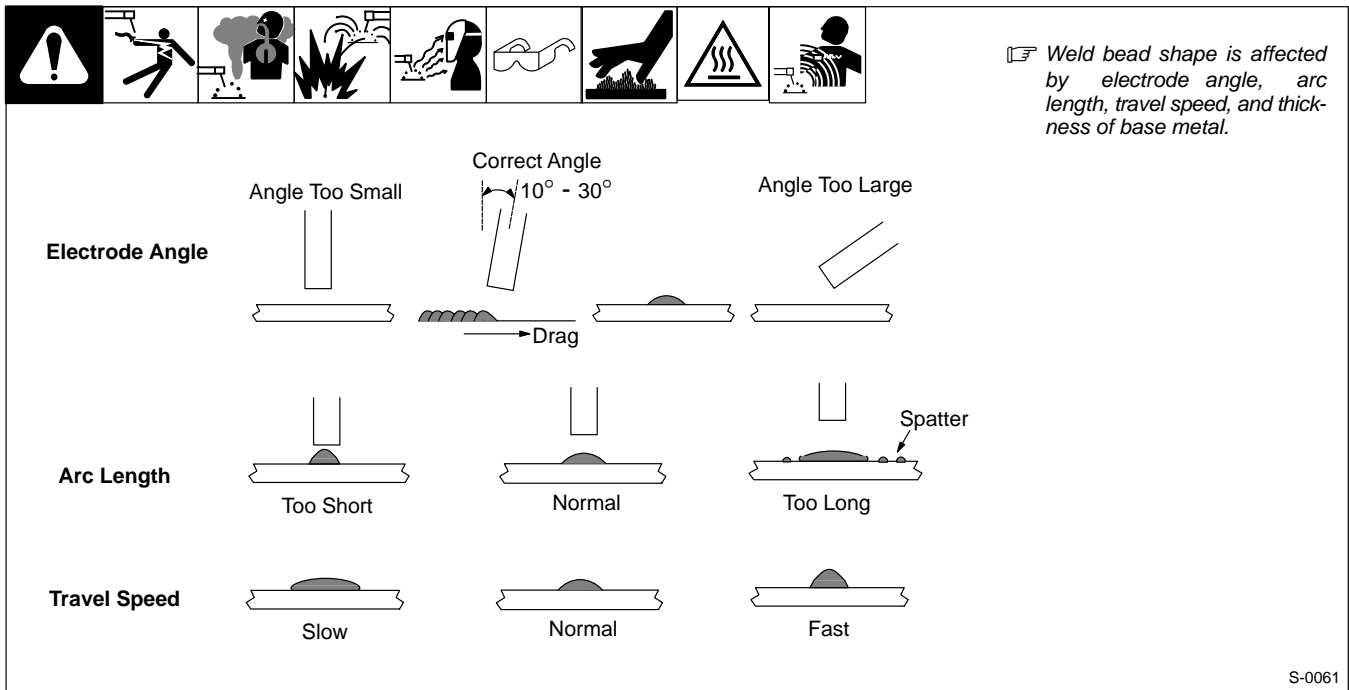
Weld a new bead or layer for each 1/8 in. (3.2 mm) thickness in metals being welded.

- 4 No Overlap
- 5 Good Penetration into Base Metal

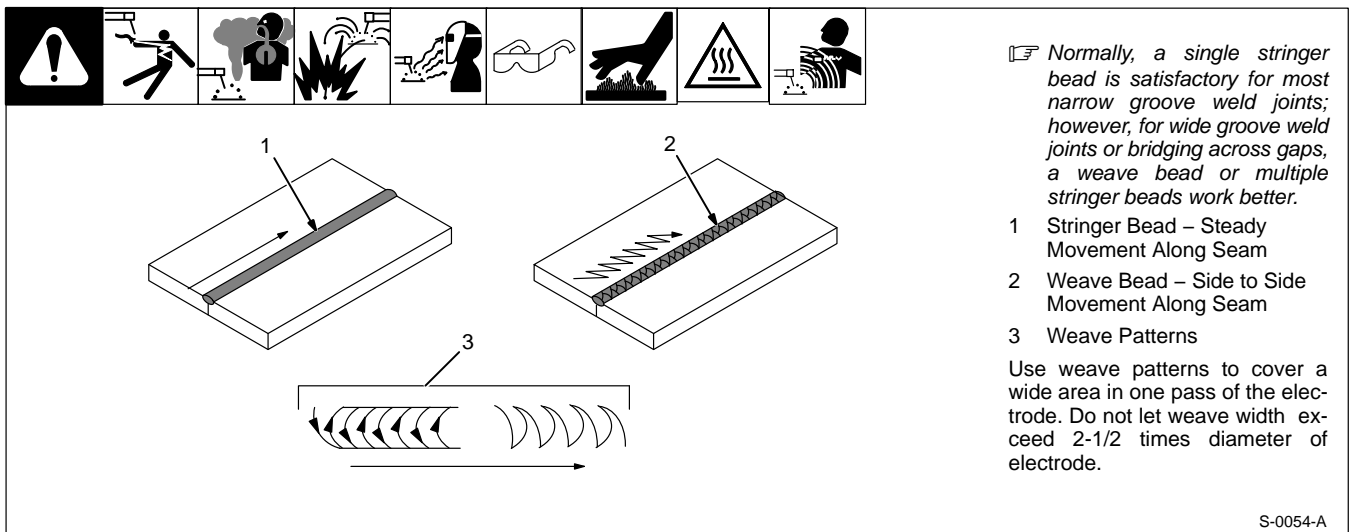
S-0052-B



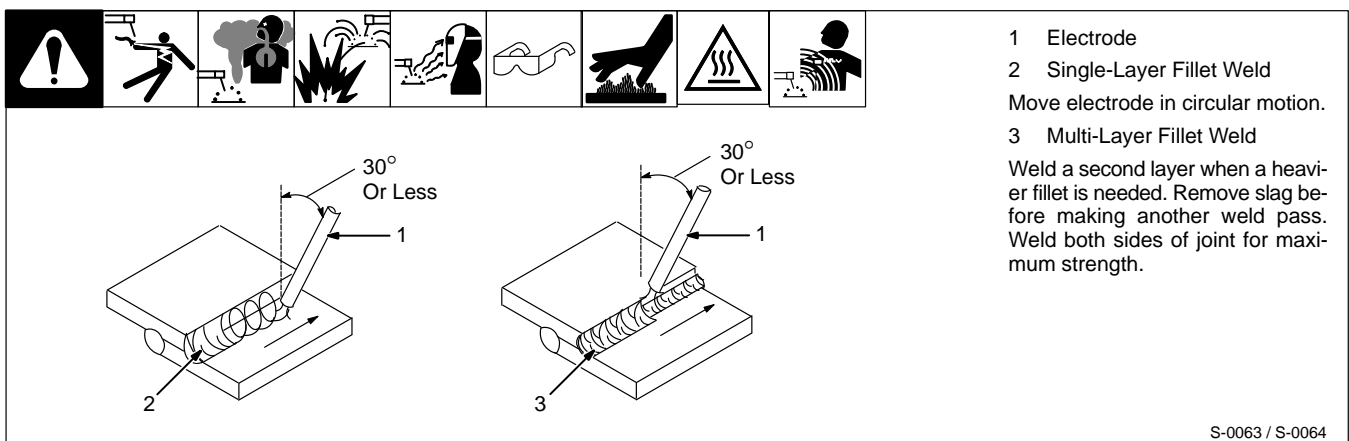
## 10-7. Conditions That Affect Weld Bead Shape



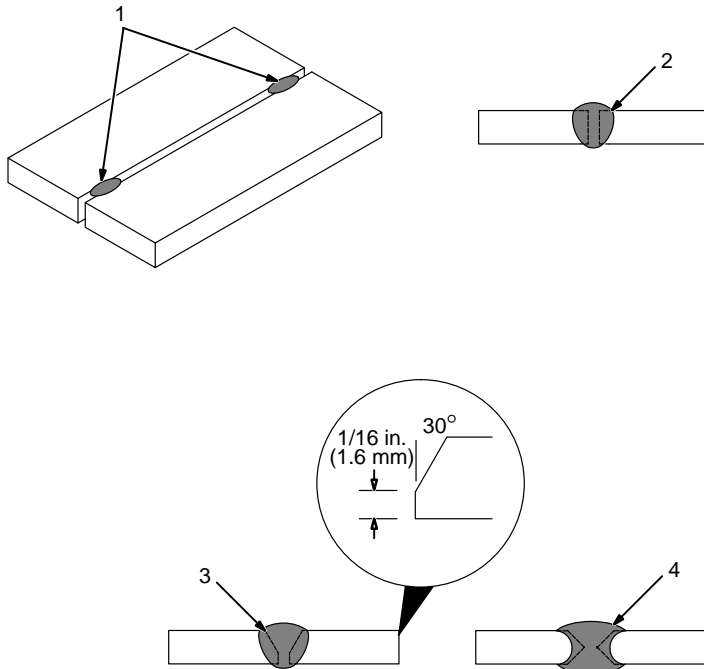
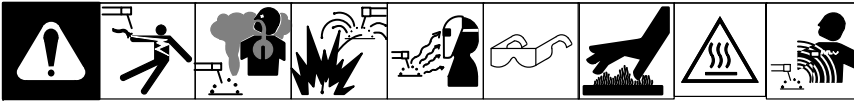
## 10-8. Electrode Movement During Welding



## 10-9. Welding Lap Joints



## 10-10. Welding Groove (Butt) Joints



### 1 Tack Welds

Prevent butt joint distortion by tack welding the materials in position before final weld.

Workpiece distortion occurs when heat is applied locally to a joint. One side of a metal plate will “curl” up toward the weld. Distortion will also cause the edges of a butt joint to pull together ahead of the electrode as the weld cools.

### 2 Square Groove Weld

### 3 Single V-Groove Weld

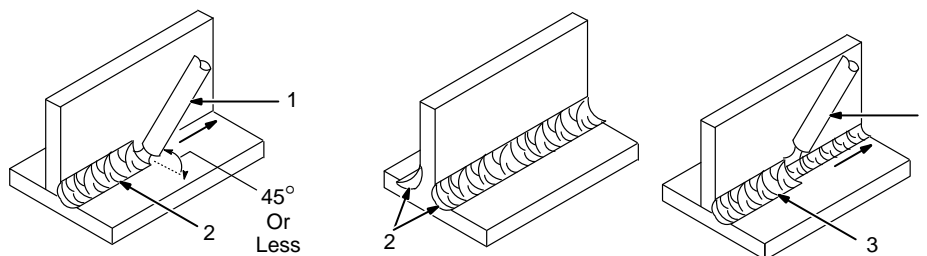
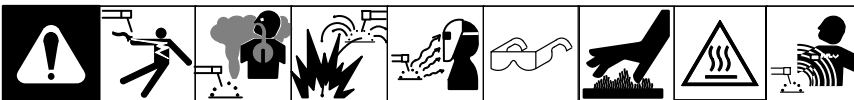
### 4 Double V-Groove Weld

Materials up to 3/16 in. (5 mm) thick can often be welded without special preparation using the square groove weld. However, when welding thicker materials it may be necessary to prepare the edges (V-groove) of butt joints to ensure good welds.

The single or double V-groove weld is good for materials 3/16 – 3/4 in. (5-19 mm) thick. Generally, the single V-groove is used on materials up to 3/4 in. (19 mm) thick and when, regardless of thickness, you can weld from one side only. Create a 30 degree bevel with oxy-acetylene or plasma cutting equipment. Remove scale from material after cutting. A grinder can also be used to prepare bevels.

S-0062

## 10-11. Welding Tee Joints



### 1 Electrode

### 2 Fillet Weld

Keep arc short and move at definite rate of speed. Hold electrode as shown to provide fusion into the corner. Square edge of the weld surface.

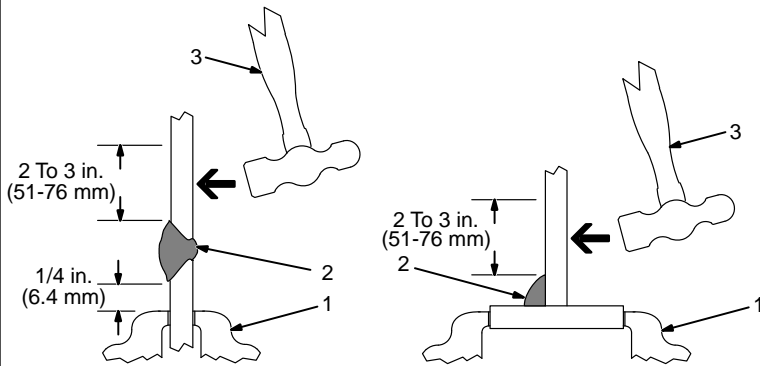
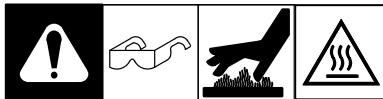
For maximum strength weld both sides of upright section.

### 3 Multi-Layer Deposits

Weld a second layer when a heavier fillet is needed. Use any of the weaving patterns shown in Section 10-8. Remove slag before making another weld pass.

S-0060 / S-0058-A / S-0061

## 10-12. Weld Test



- 1 Vise
- 2 Weld Joint
- 3 Hammer

Strike the weld joint in the direction shown. A good weld bends over but does not break.

If the weld breaks, examine it to determine the cause.

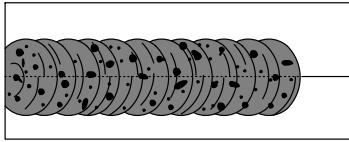
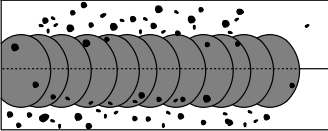
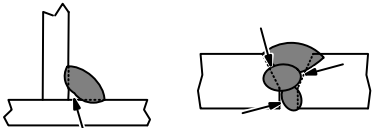
If the weld is porous (many holes), the arc length was probably too long.

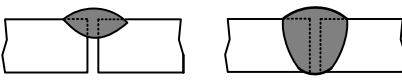
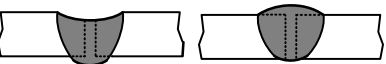
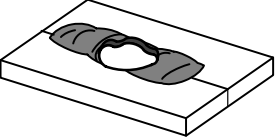
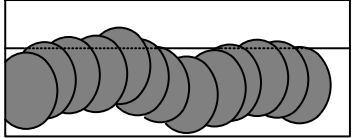
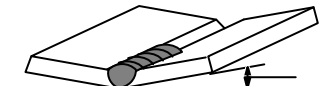
If the weld contains bits of slag, the arc may have been too long or the electrode was moved incorrectly which allowed molten slag to be trapped in the weld. This may happen on a V-groove joint made in several layers and calls for additional cleaning between layers.

If the original beveled surface is visible the material was not fully melted which is often caused by insufficient heat or too fast a travel speed.


S-0057-B

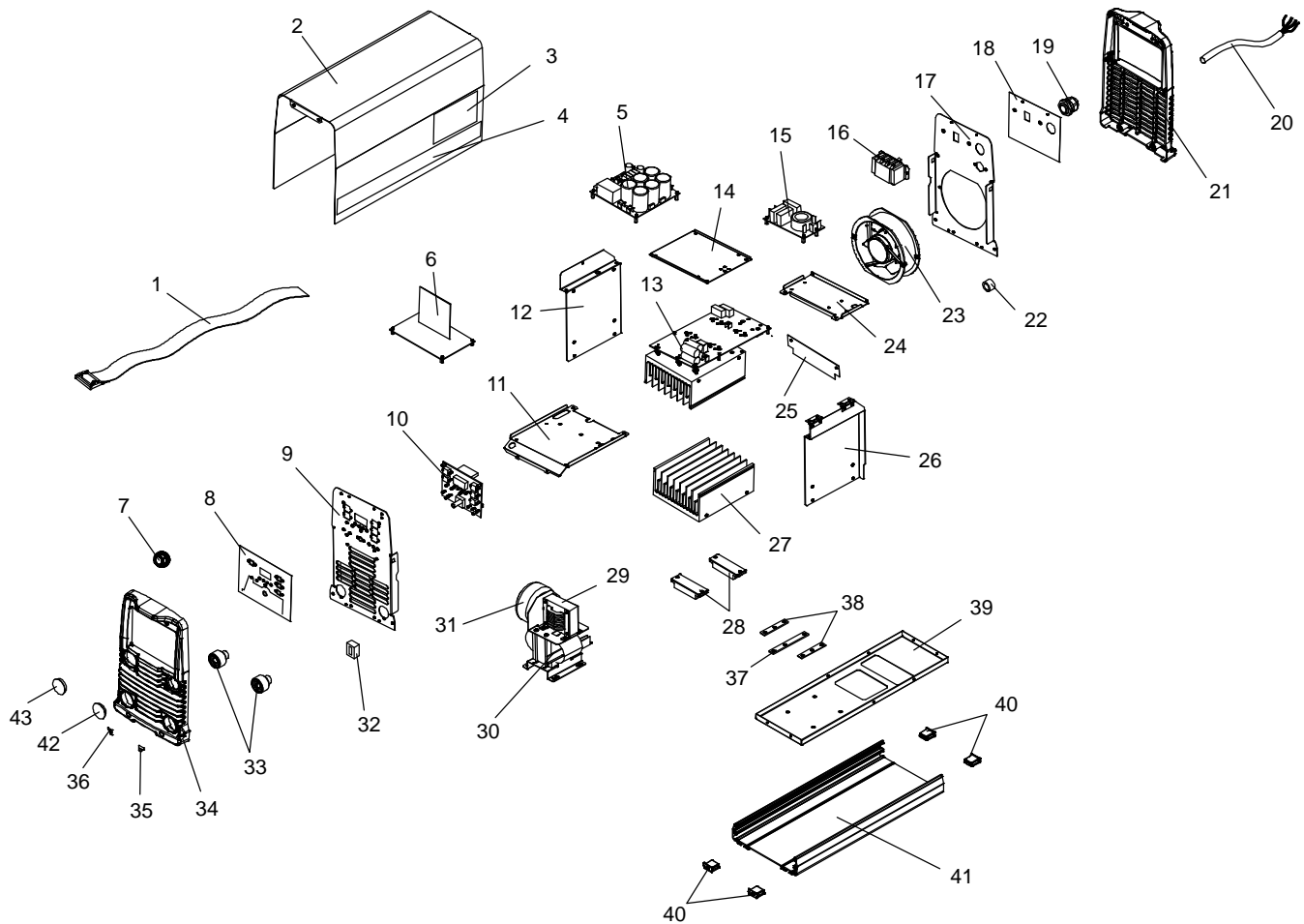
## 10-13. Troubleshooting

	<p><b>Porosity</b> – small cavities or holes resulting from gas pockets in weld metal.</p>
<p><b>Possible Causes</b></p>	<p><b>Corrective Actions</b></p>
<p>Arc length too long.</p>	<p>Reduce arc length.</p>
<p>Damp electrode.</p>	<p>Use dry electrode.</p>
<p>Workpiece dirty.</p>	<p>Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.</p>
	<p><b>Excessive Spatter</b> – scattering of molten metal particles that cool to solid form near weld bead.</p>
<p><b>Possible Causes</b></p>	<p><b>Corrective Actions</b></p>
<p>Amperage too high for electrode.</p>	<p>Decrease amperage or select larger electrode.</p>
<p>Arc length too long or voltage too high.</p>	<p>Reduce arc length or voltage.</p>
	<p><b>Incomplete Fusion</b> – failure of weld metal to fuse completely with base metal or a preceeding weld bead.</p>
<p><b>Possible Causes</b></p>	<p><b>Corrective Actions</b></p>
<p>Insufficient heat input.</p>	<p>Increase amperage. Select larger electrode and increase amperage.</p>
<p>Improper welding technique.</p>	<p>Place stringer bead in proper location(s) at joint during welding.</p>
	<p>Adjust work angle or widen groove to access bottom during welding.</p>
	<p>Momentarily hold arc on groove side walls when using weaving technique.</p>
	<p>Keep arc on leading edge of weld puddle.</p>
<p>Workpiece dirty.</p>	<p>Remove all grease, oil, moisture, rust, paint, coatings, slag, and dirt from work surface before welding.</p>

 <p>Lack of Penetration      Good Penetration</p>	<p><b>Lack Of Penetration</b> – shallow fusion between weld metal and base metal.</p>
<p><b>Possible Causes</b></p>	<p><b>Corrective Actions</b></p>
<p>Improper joint preparation.</p>	<p>Material too thick. Joint preparation and design must provide access to bottom of groove.</p>
<p>Improper weld technique.</p>	<p>Keep arc on leading edge of weld puddle.</p>
<p>Insufficient heat input.</p>	<p>Increase amperage. Select larger electrode and increase amperage.</p>
	<p>Reduce travel speed.</p>
 <p>Excessive Penetration      Good Penetration</p>	<p><b>Excessive Penetration</b> – weld metal melting through base metal and hanging underneath weld.</p>
<p><b>Possible Causes</b></p>	<p><b>Corrective Actions</b></p>
<p>Excessive heat input.</p>	<p>Select lower amperage. Use smaller electrode.</p>
	<p>Increase and/or maintain steady travel speed.</p>
	<p><b>Burn-Through</b> – weld metal melting completely through base metal resulting in holes where no metal remains.</p>
<p><b>Possible Causes</b></p>	<p><b>Corrective Actions</b></p>
<p>Excessive heat input.</p>	<p>Select lower amperage. Use smaller electrode.</p>
	<p>Increase and/or maintain steady travel speed.</p>
	<p><b>Waviness Of Bead</b> – weld metal that is not parallel and does not cover joint formed by base metal.</p>
<p><b>Possible Causes</b></p>	<p><b>Corrective Actions</b></p>
<p>Unsteady hand.</p>	<p>Use two hands. Practice technique.</p>
 <p>Base metal moves in the direction of the weld bead.</p>	<p><b>Distortion</b> – contraction of weld metal during welding that forces base metal to move.</p>
<p><b>Possible Causes</b></p>	<p><b>Corrective Actions</b></p>
<p>Excessive heat input.</p>	<p>Use restraint (clamp) to hold base metal in position.</p>
	<p>Make tack welds along joint before starting welding operation.</p>
	<p>Select lower amperage for electrode.</p>
	<p>Increase travel speed.</p>
	<p>Weld in small segments and allow cooling between welds.</p>

# SECTION 11 – PARTS LIST

 Hardware is common and not available unless listed.



956172127\_7-A

**Figure 11-1. Main Assembly For STi 270**

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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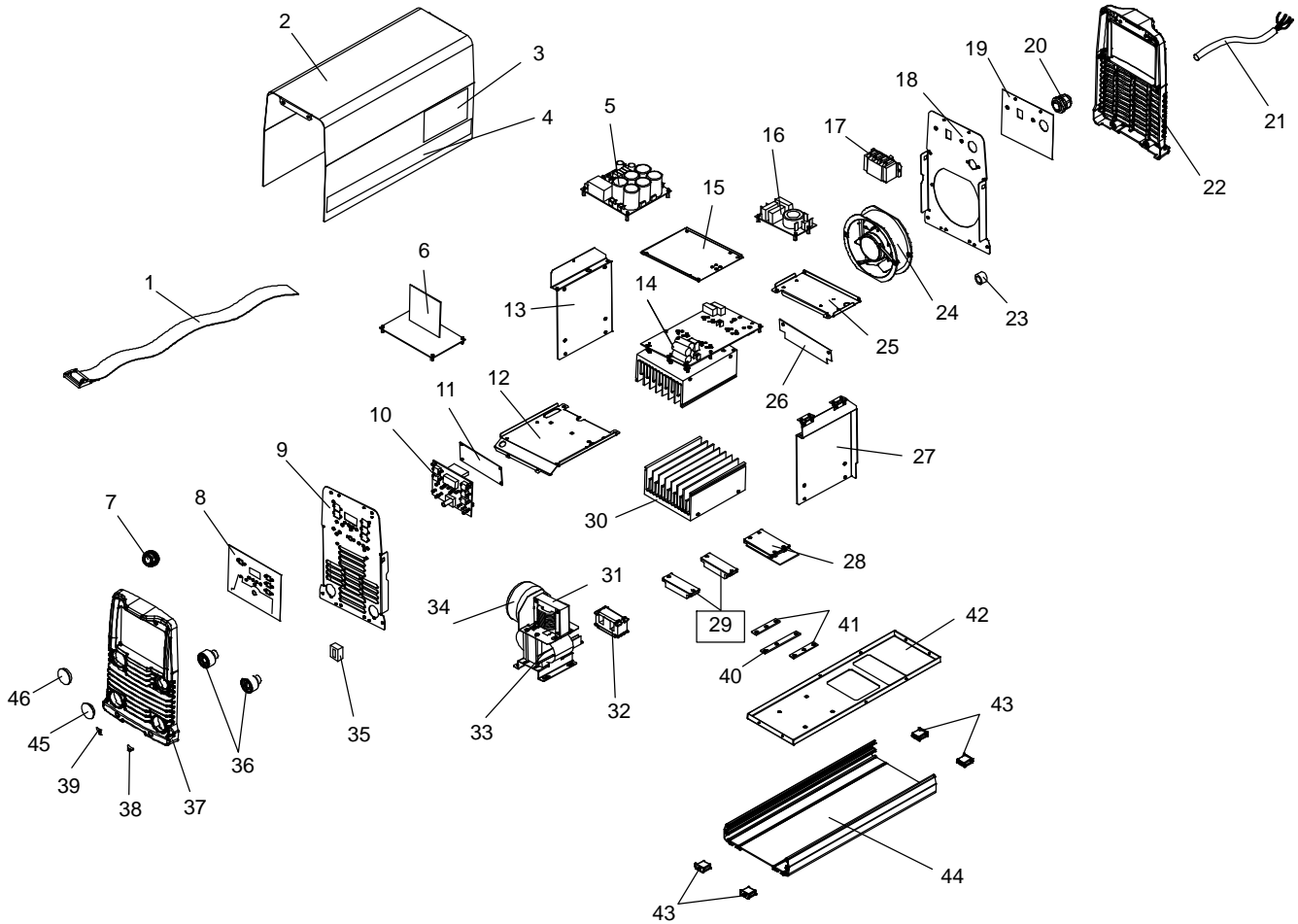
**Figure 11-1. Main Assembly For STi 270**

...	1	...	057116003	...	Strap, Shoulder Assy	...	1
...	2	...	+156122096	...	Wrapper	...	1
...	3	...	179310	...	Label, Gen. Precautionary	...	2
...	4	...	956172112	...	Label, Side STi 270	...	2
...	5	PC5	057084194	...	Circuit Card, Capacitor And Relay Board	...	1
...	6	PC1	057084199	...	Circuit Card, Inverter Control Board	...	1
...	7	...	193919	...	Knob, Pointer	...	1
...	8	...	356029259	...	Nameplate, Front, STi 270	...	1
...	9	...	156118094	...	Panel, Front	...	1
...	10	PC3	057084196	...	Circuit Card, Display Board	...	1
...	11	...	156122097	...	Bulkhead, Front	...	1
...	12	...	156005192	...	Bracket, LH	...	1
...	13	PC2	028069156	...	Circuit Card, Power Interconnecting Board	...	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
<b>Figure 11-1. Main Assembly For STi 270 (continued)</b>				
... 14		156005193	Bracket, Door	1
... 15	PC4	057084198	Circuit Card, Filter Board	1
... 16	S1	244920	Switch, TGL 3PST 40A 600 VAC SCR Term Wide TGL	1
... 17		156118096	Panel, Rear	1
... 18		356029264	Nameplate, Rear, STi 270–270C	1
... 19		656089046	Strain Relief, M25x1.5	1
... 20		256071011	Cable, Primary 4 Core 2.5 MM 2 3.3 MT	1
... 21		246624	Bezel, Rear	1
... 22	LF	156160003	Core, Toroidal, 13x26x28.5	1
... 23	FM	057035023	Fan, 230 VAC	1
... 24		156122098	Bulkhead, Rear	1
... 25		756033060	Insulator, Secondary Output	1
... 26		156005194	Bracket, RH	1
... 27		056082105	Heat Sink, Secondary Output	1
... 28	D1, D2	028069158	Kit, Diode Power Module	2
... 29	L1	057098025	Choke	1
... 30	T1	058021164	Transformer	1
... 31	T2	058021163	Transformer, Toroidal 400 VAC	1
... 32	HD1	056167009	Probe, 400A	1
... 33		056076260	Dinse, Socket, Female, 50 MMQ	2
... 34		246623	Bezel, Front	1
... 35		956172116	Label, Negative	1
... 36		956172115	Label, Positive	1
... 37		216031080	Bus Bar, 3x15 L.110	1
... 38		316031024	Bus Bar, 4x20 L.110	2
... 39		156006094	Base, Internal	1
... 40		250946	Foot, Base	4
... 41		246626	Base	1
... 42		656043049	Hole Cap, D 31.5	1
... 43		656043050	Hole Cap, D 40	1

+ When ordering a component originally displaying a precautionary label, the label should also be ordered.

**To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.**



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**Figure 11-2. Main Assembly For STi 270C**

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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**Figure 11-2. Main Assembly For STi 270C**

...	1	...	057116003	...	Strap, Shoulder Assy	...	1
...	2	...	+156122096	...	Wrapper	...	1
...	3	...	179310	...	Label, Gen. Precautionary	...	2
...	4	...	956172113	...	Label, Side STi 270	...	2
...	5	PC5	057084194	...	Circuit Card, Capacitor And Relay Board	...	1
...	6	PC1	057084195	...	Circuit Card, Inverter Control Board	...	1
...	7	...	193919	...	Knob, Pointer	...	1
...	8	...	356029260	...	Nameplate, Front, STi 270	...	1
...	9	...	156118094	...	Panel, Front	...	1
...	10	PC3	057084196	...	Circuit Card, Display Board	...	1
...	11	PC6	057084197	...	Circuit Card, Cad CITO MMA	...	1
...	12	...	156122097	...	Bulkhead, Front	...	1
...	13	...	156005192	...	Bracket, LH	...	1
...	14	PC2	028069156	...	Circuit Card, Power Interconnecting Board	...	1
...	15	...	156005193	...	Bracket, Door	...	1
...	16	PC4	057084198	...	Circuit Card, Filter Board	...	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
<b>Figure 11-2. Main Assembly For STi 270C (continued)</b>				
... 17	S1	244920	Switch, TGL 3PST 40A 600 VAC SCR Term Wide TGL	1
... 18		156118096	Panel, Rear	1
... 19		356029264	Nameplate, Rear, STi 270–270C	1
... 20		656089046	Strain Relief, M25x1.5	1
... 21		256071011	Cable, Primary 4 Core 2.5 MM 2 3.3 MT	1
... 22		246624	Bezel, Rear	1
... 23	LF	156160003	Core, Toroidal, 13x26x28.5	1
... 24	FM	057035023	Fan, 230 VAC	1
... 25		156122098	Bulkhead, Rear	1
... 26		756033060	Insulator, Secondary Output	1
... 27		156005194	Bracket, Rh	1
... 28	PC7	028069159	Circuit Card, Mod Citoflex	1
... 29	D1, D2	028069158	Kit, Diode Power Module	2
... 30		056082105	Heat Sink, Secondary Output	1
... 31	L1	057098025	Choke	1
... 32	L2	057098026	Choke, 30 A Citoflex	1
... 33	T1	058021162	Transformer	1
... 34	T2	058021163	Transformer, Toroidal 400 VAC	1
... 35	HD1	056167009	Probe, 400 A	1
... 36		056076260	Dinse, Socket, Female, 50 MMQ	2
... 37		246623	Bezel, Front	1
... 38		956172116	Label, Negative	1
... 39		956172115	Label, Positive	1
... 40		216031080	Bus Bar, 3x15 L.110	1
... 41		316031024	Bus Bar, 4x20 L.110	2
... 42		156006094	Base, Internal	1
... 43		250946	Foot, Base	4
... 44		246626	Base	1
... 45		656043049	Hole Cap, D 31.5	1
... 46		656043050	Hole Cap, D 40	1

+ When ordering a component originally displaying a precautionary label, the label should also be ordered.

**To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.**









Effective January 1, 2013  
(Equipment with a serial number preface of MD or newer)

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

**LIMITED WARRANTY** – Subject to the terms and conditions below, ITW Welding Products Italy warrants to its original retail purchaser that new Miller equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by Miller. **THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.**

Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed.

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date the equipment was delivered to the original retail purchaser or one year after the equipment is shipped to a European distributor or eighteen months after the equipment is shipped to an International distributor.

1. 5 Years Parts — 3 Years Labor
  - \* Original main power rectifiers only to include SCRs, diodes, and discrete rectifier modules with exclusion of STR, Si, STI, STH and MPi series.
2. 3 Years — Parts and Labor
  - \* Engine Driven Welding Generators  
**(NOTE: Engines are warranted separately by the engine manufacturer.)**
  - \* Inverter Power Sources (Unless Otherwise Stated)
  - \* Process Controllers
  - \* Semi-Automatic and Automatic Wire Feeders
  - \* Transformer/Rectifier Power Sources
  - \* Water Coolant System (Integrated)
3. 2 Years — Parts
  - \* Auto-Darkening Helmet Lenses (No Labor)
  - \* Migmatic 175
  - \* HF Units
  - \* Water Coolant Systems (EU Models, Non-Integrated)
4. 1 Year — Parts and Labor Unless Specified
  - \* Automatic Motion Devices
  - \* Field Options  
**(NOTE: Field options are covered under True Blue® for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)**
  - \* Induction Heating Power Sources, Coolers, and Electronic Controls/Recorders
  - \* Motor Driven Guns (w/exception of Spoolmate Spoolguns)
  - \* Positioners and Controllers
  - \* Powered Air Purifying Respirator (PAPR) Blower Unit (No Labor)
  - \* Racks
  - \* Running Gear and Trailers
  - \* Subarc Wire Drive Assemblies
  - \* Water Coolant Systems (USA Models, Non-Integrated)
  - \* Work Stations/Weld Tables (No Labor)
5. 6 Months — Parts
  - \* Batteries

6. 90 Days — Parts
  - \* Accessory (Kits)
  - \* Canvas Covers
  - \* Induction Heating Coils and Blankets
  - \* MIG Guns
  - \* Remote Controls
  - \* Replacement Parts (No Labor)
  - \* Spoolmate Spoolguns
  - \* Cables and Non-Electronic Controls

Miller's True Blue® Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, switches, slip rings, relays or parts that fail due to normal wear.**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller's option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. Miller's option of repair or replacement will be F.O.B., Factory at ITW Welding Products Group Europe or F.O.B. at a Miller authorized service facility as determined by Miller. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

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# Owner's Record

Please complete and retain with your personal records.

Model Name

Serial/Style Number

Purchase Date

(Date which equipment was delivered to original customer.)

Distributor

Address

Country

Zip/Postal Code



# For Service

**Contact a *DISTRIBUTOR* or *SERVICE AGENCY* near you.**

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:

Welding Supplies and Consumables

Options and Accessories

Service and Repair

Replacement Parts

Owner's Manuals

Contact the Delivering Carrier to:

File a claim for loss or damage during shipment.

For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

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